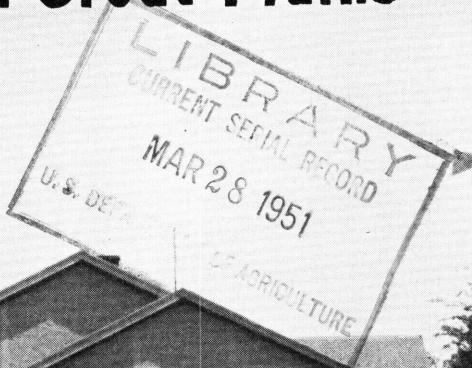


Historic, archived document

Do not assume content reflects current
scientific knowledge, policies, or
practices.

984F
6

Ornamental Shrubs for the Southern Great Plains



FARMERS' BULLETIN No. 2025
U.S. DEPARTMENT OF AGRICULTURE

ORNAMENTAL shrubs play an important role in the landscaping of farm- and ranch-home grounds. The problems of growing shrubs on the southern Great Plains are very different from those in humid areas in the United States. Among the important climatic factors that affect the establishment and growth of shrubs on the southern Great Plains are limited rainfall, early-fall and late-spring freezes, and the almost constant wind.

The rigorous climate of the area makes necessary special care in the selection, planting, protection, and maintenance of shrub species. The short growing season in the higher elevations along the eastern slopes of the Rocky Mountains and the northern boundary of the southern Great Plains and the comparatively long growing season along the eastern boundary, where the elevation is less than 1,000 feet, make possible an interesting study of shrub species that will survive. This bulletin discusses the influence of various factors on shrubs and gives the size, form, use, methods of propagation, and behavior of shrubs tested in various parts of the southern Great Plains area.

ORNAMENTAL SHRUBS FOR THE SOUTHERN GREAT PLAINS

By E. W. JOHNSON, *associate silviculturist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration*

Contents

	Page		Page
Introduction.....	1	Cutting back shrubs before planting.....	5
Southern Great Plains area defined.....	2	Planting.....	5
Factors affecting establishment and growth of shrubs.....	3	Care of shrubs.....	6
Climatic conditions.....	3	Pruning.....	7
Topography and soil.....	4	Life expectancy of shrubs.....	7
Selecting shrub planting stock....	4	Shrub species notes.....	8
		Index to common names.....	61

INTRODUCTION

SHRUBS of many kinds are valuable for transforming a barren house into an attractive, livable home. On the southern Great Plains,¹ where the problems in growing shrubs are very different from those in humid areas, residents who wish to improve their surroundings by landscaping them need pertinent information on suitable shrubs. The purpose of this bulletin is to assist farmers and ranchers in the selection and the use of shrubs for farm- and ranch-home grounds.

Since the establishment of the Southern Great Plains Field Station at Woodward, Okla., in 1914, there has been a continued search for plants that might be useful on the southern Great Plains. In 1931 there was started a definite program to determine by experimental plantings what species and varieties of ornamental plants are best adapted to the area as a whole and to the various sections of it. In such plantings it has also been the intention to determine the best methods of planting, pruning, training, and general management.

The main experimental plantings have been made on the grounds of the Southern Great Plains Field Station, of the several other field stations of the U. S. Department of Agriculture, of State branch agricultural experiment stations, and of other Federal or State

¹ In accordance with local usage and to avoid monotony, Plains and southern Plains when used in this bulletin take the place of southern Great Plains to designate the area shown in fig. 1.

institutions with which cooperative agreements have been made. Such institutions are too few, however, to permit testing of plant materials under all the conditions that prevail on the Plains and are so distant from certain localities that people living there are not benefited by the regular demonstrations afforded by the plantings. In addition, many plants that may be valuable under the expert care given at experiment stations or other institutions do not meet the needs or suit the methods of practical farmers and ranchers. For these reasons it has been desirable to establish a number of cooperative test plantings with residents of the area.

Cooperative experimental plantings now established with more than 500 farmers and ranchers in over 100 counties in the southern Great Plains area have made possible observations on a rather wide variety of plant materials under practical conditions. The planting sites were recommended by the county or home-demonstration agents in the various counties. Before World War II each site was personally inspected by a representative of the Department of Agriculture prior to the planting season. Because of the vast extent of the southern Great Plains and the limitations of personnel and facilities, cooperative and experimental plantings have been limited to those parts of the Plains where they will be of most value in determining what is adapted to the area in general.

There has been a tendency to concentrate the cooperative experimental plantings in sections where interest is particularly active, as shown by the initiative of people in improving home surroundings, and where, therefore, demonstrations that include new plants will be most helpful to many people. Only those farmers and ranchers who have an interest in ornamental plants and a knowledge of how to handle them and who were willing to enter into the program as experimenters rather than because of any certainty of benefits to themselves were selected as cooperators. The total number of plantings was generally limited per county except where local demands for more concentrated studies warranted additional plantings.

SOUTHERN GREAT PLAINS AREA DEFINED

The southern Great Plains is generally defined as that portion of the United States lying between the 98th meridian and the Rocky Mountains and between the Arkansas River and a line extending the southern boundary of New Mexico. More specifically the area (fig. 1) is bounded on the west by the Rocky Mountains. On the east it includes Reno, Kingman, and Harper Counties, Kans.; Alfalfa, Major, Blaine, Caddo, Comanche, and Cotton Counties, Okla.; and Clay, Jack, Palo Pinto, and Erath Counties, Tex. On the south it includes Erath, Eastland, Callahan, Taylor, Nolan, Mitchell, Howard, Martin, and Andrews Counties, Tex.; and it follows the southern boundary of New Mexico to the Rocky Mountains. The northern border includes Reno, Stafford, Pawnee, Hodgeman, Finney, Kearny, and Hamilton Counties, Kans.; and Prowers, Bent, and Las Animas Counties, Colo.

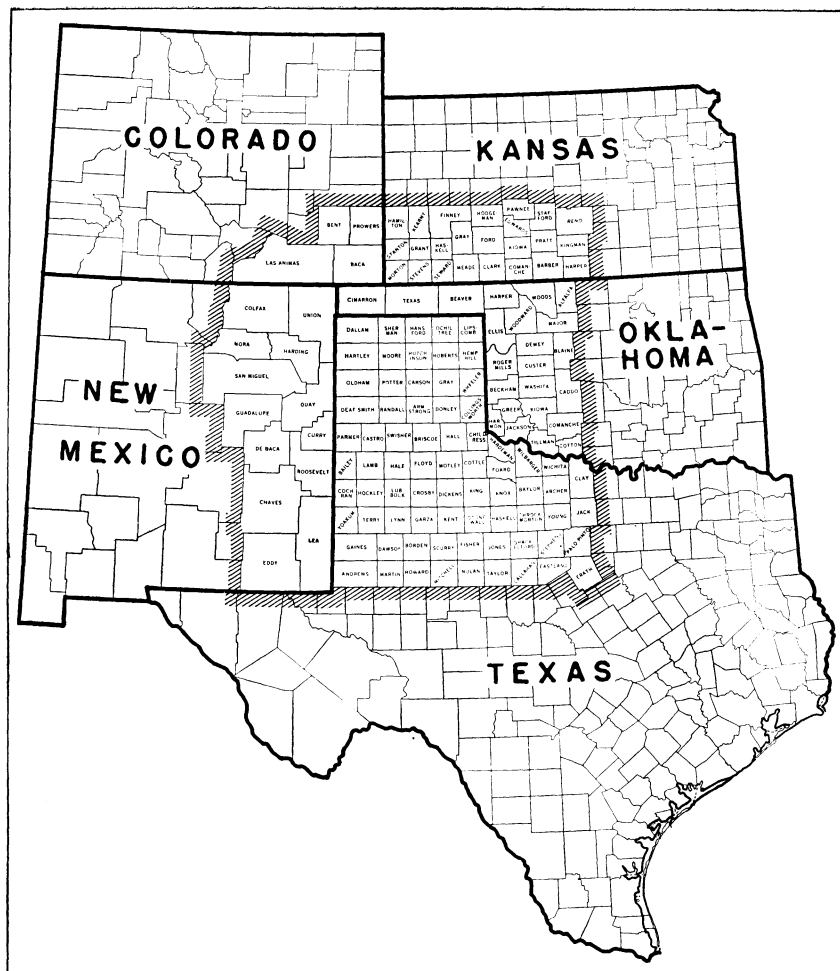


Figure 1.—Map showing, within cross-hatched lines, the boundaries of the southern Great Plains.

FACTORS AFFECTING ESTABLISHMENT AND GROWTH OF SHRUBS

CLIMATIC CONDITIONS

Precipitation is one of the principal factors affecting the establishment and growth of shrubs. The average annual rainfall in the southern Great Plains ranges from 30 inches along the eastern boundary to about 12 inches in parts of the western section. The severe drought years during the 1930's proved the limitation in the selection of shrub species for parts of the Plains. When field crops proved to be failures for several consecutive years, maintaining shrubs with but a limited amount of irrigation turned out to be difficult. Although most ornamental farmstead plantings receive some irrigation, the

average annual precipitation very often determines the type of shrubs that can be used.

Other climatic factors of the southern Great Plains that affect plants include early-fall freezes, late-spring freezes following mild winter weather, hail, sleet, and drying winds during any part of the winter or spring and nearly always during some part of the summer. Detailed tables for various climatic factors are not given here, as general weather data can be found in the 1941 Yearbook of Agriculture, entitled "Climate and Man."

Items such as a high-velocity wind immediately after the planting of shrubs do not appear in tables of climatic data. When such winds are laden with soil from adjoining fields, the survival percentage is even smaller than usual. During midsummer it is often possible to have 30 or more days without any effective precipitation; application of irrigation tends to keep some shrub species alive, but it does not allow them to make the growth or show the vigor that one visualizes in an attractively landscaped farm- or ranch-home planting.

TOPOGRAPHY AND SOIL

Along the eastern fringe of the southern Great Plains the elevation is less than 1,000 feet. In Colfax County, N. Mex., along the eastern slopes of the Rocky Mountains the elevation is approximately 6,600 feet. This wide range in elevation permits an interesting study of the species that will survive. The more southerly shrub species, which prefer a relatively warm climate and a long growing season, are out of place at the higher elevation, under conditions that are almost opposite.

The great variations in the soils in the southern Great Plains area affect the selection of species. Over most of the area the soils are generally very fertile, and all that is necessary for plant growth is moisture. The soil problem as related to shrubs is complicated, since farmstead sites were often chosen for the view rather than the soil. Home sites located on top of small knolls often have a relatively shallow soil underlain by caliche, gravel, or hardpan. Detailed studies of soils on the southern Great Plains with special reference to the growing of shrubs have not been possible. The diversity in soil character is shown in soil treatments made to correct chlorosis in shrubs. At the Woodward station a single treatment with iron sulfate effectively controls chlorosis for 6 years or more, whereas the same treatment in the southern part of Union County, N. Mex., is effective for only one growing season.

SELECTING SHRUB PLANTING STOCK

Careful consideration should be given to the condition of the shrubs when they are obtained for planting. Select vigorous stock that has been grown locally or as close as possible to the planting site. Plants that are 2 to 4 years old, the age depending upon the species, are preferable. Very small so-called "bargain" plants may turn out to be "runts" that will not transplant successfully. Purchase freshly dug planting stock rather than storage stock. Storage stock obtained

from reliable nurserymen who are careful in controlling storage conditions will give satisfactory results, but stock that has been carelessly handled always survives poorly. Young deciduous shrubs can be handled bare-rooted, but conifers and broadleaved evergreen shrubs should always be transplanted with a ball of earth. Large deciduous shrubs planted for immediate effect should be purchased balled and burlapped.

CUTTING BACK SHRUBS BEFORE PLANTING

When plants are dug from the nursery row, a considerable proportion of the roots are cut off and left in the soil. In order to balance the tops and roots, it is necessary to cut back the tops. The best practice is to disregard the top growth of young deciduous plants and prune them back to within a few inches of the old nursery level. Then new growth will start at the ground level, and a shrub having a symmetrical form will develop. Instead of four or five spindly canes, two or three times this number of canes will develop and make the framework for a more desirable shrub. The procedure recommended may seem rather drastic, but tests have shown that a higher percentage of the shrubs survive and a better form results. Conifers, broadleaved evergreen shrubs, and large deciduous specimen plants that are balled and burlapped do not need any pruning if they have been properly cared for in the nursery row.

PLANTING

Shrubs should be planted as quickly as possible after being dug from the nursery row. If shrubs are received at a time when it is not practicable to plant them, they should be heeled in in a shallow trench and thoroughly watered. Do not expose the root system to drying. When weather conditions prevent heeling in in the soil, the nursery package should be opened and the shrubs examined for condition. The roots can be kept in good condition by keeping the packing medium (moss, shingletow, or straw) moist and storing the package in a cool basement until the planting can be done.

Holes for planting shrubs should be large enough to accommodate the roots when they are spread out in a natural position. Do not crowd the roots into a small hole, but spread them out and fill in around them with pulverized soil. If the soil is of poor quality, it will pay to use a good topsoil in filling the hole. Set the plant 1 or 2 inches below the original nursery level. After filling the hole within a few inches of the top, add sufficient water so that the earth particles will settle in close contact with the roots. Settling the soil with water is safer than tamping. When the water has soaked in, add enough soil to bring the earth to the proper level around the shrub. This level should be several inches below the surrounding ground level, in order to provide a shallow basin for later watering. Commercial fertilizers or barnyard manures should not be used in direct contact with the roots. If fertilizer is needed, it should be applied in the topsoil after transplanting.

On very difficult sites where caliche or other undesirable deposits are close to the surface, the holes should be dug two to three times

the usual size and refilled with good topsoil. When the shrub roots work through this good soil to the caliche, a chlorotic condition is likely to develop.

The proper time to plant shrubs in the southern two-thirds of the southern Plains is entirely dependent on the type of weather. During so-called "normal" seasons shrubs can be planted all winter long and during the early spring. When severe fall and winter weather is experienced, it is safer to postpone planting until early spring. In the northern third of the southern Plains it is best to confine planting to early spring. A practical guide to follow is to get the plants in the ground prior to the development of new growth. Transplanting late in the season after new growth has started will often give poor results; if it does not actually kill the plants, it certainly sets them back so that very little growth is made the first season.

The spacing of shrubs is dependent upon the size and form of the species. On the southern Plains it is best to allow plenty of room between plants. Large-growing shrubs should be 8 to 12 feet apart, medium-sized ones 4 to 8 feet apart, and small ones 2 to 4 feet apart. In screen and mass border plantings there should be plenty of room for the various species to reach their normal size. In foundation plantings it may be necessary to use a closer planting interval; but if this is done it will be necessary to practice careful, periodic pruning. The tendency in foundation plantings is to plant 18 to 24 inches from the wall. This might be satisfactory for very small species, but it is not for medium-sized or large shrubs. These should be 3 to 5 feet from the wall. By noting the general form and size of the various species, as given under Shrub Species Notes, the proper spacing interval for each can be determined.

CARE OF SHRUBS

In areas of limited rainfall it is impossible for the land to support more than one type of crop. On the southern Great Plains it is necessary to keep all weeds and grasses from encroaching on that portion of the soil required for the development of a shrub. Bermuda grass should be kept edged 3 to 4 feet away from shrubs. The soil around the base of a shrub should be cultivated as frequently as possible after watering or rains. Cultivation not only discourages germination and growth of undesirable plants but also limits wind and water erosion and keeps the soil in a receptive state for water absorption.

Even the so-called "hardiest" shrubs have to be given some irrigation when used in yard plantings, because of their relatively confined position in competition with the lawn and with other shrubs. A shrub planted so that it has 200 square feet of cultivated soil from which it can draw nutrients and moisture will survive without irrigation, but the same shrub under yard conditions has a smaller area of soil to draw upon and needs irrigation and possibly some feeding.

When need of plant food is indicated, the quickest response can be obtained by use of commercial fertilizers that contain ammonium sulfate. Ammonium nitrate fertilizer does not give as quick a response, but tests show that its effect lasts longer. Use of barnyard manures should be discouraged on soils on which shrubs tend to develop a chlorotic condition. Tests at the Woodward station and ob-

servations at many other locations show that the addition of barnyard manures tends to increase the degree of chlorosis in shrubs. If barnyard manures are used, it would be well to add iron sulfate and either ammonium sulfate or ammonium nitrate. Detailed information regarding the use of commercial fertilizers can be obtained from the local county and home-demonstration agents.

PRUNING

Too little attention is generally given to the pruning of shrubs. The usual procedure is to plant shrubs and then let them take care of themselves as far as form and size are concerned. As a result many plantings have an overgrown appearance. Pruning at regular intervals increases the vigor of plants, helps them grow into the proper form, and makes them produce better flowers and fruits. New cane development can be induced in some shrub species by cutting out old wood at the ground level. This is especially true of Vanhoutte spirea. Tipping back exceptionally vigorous branches during the growing season tends to keep the form of a shrub more pleasing. This does not mean clipping the entire shrub as is done in shearing hedges, but merely the cutting back of rampant branches. Many shrub species bloom more prolifically if they are cut back to the ground every winter. This is true of Kashgar tamarix and desertwillow (*Chilopsis*). Methods of pruning various species are discussed under Shrub Species Notes.

LIFE EXPECTANCY OF SHRUBS

Shrub species vary considerably in the number of years that they can be expected to remain pleasing and useful in farm- or ranch-yard plantings. Many shrubs such as spirea, tamarix, euonymus, lilac, and shrub-althea can be used for 20 years or more on the better planting sites on the southern Plains. These same species, however, if subjected to a series of drought years, repeated hailstorms, or neglect may become unsightly and defeat the purpose for which they were planted. When this happens there should be no hesitancy in removing any or all of the plants and making replacements. Shrubs that are vigorous to very vigorous in rate of growth require only a few years to make a good showing. Foundation plantings very often contain species that are either too slow in rate of growth or too vigorous, and these soon throw a planting out of balance. Plantings that are out of balance should be removed and undesirable species replaced with desirable ones. As a general rule, a foundation planting that has made a good showing for 10 to 15 years has more than paid for the expense of buying and maintaining the plants. By removing the plants and replanting in a different pattern the species that have proved most satisfactory, a new more interesting effect can be achieved. Border plantings should be renewed periodically, or interest in them is likely to lag to such a degree that they are neglected.

Somewhere in the yard there should be a place for expansion, where new plant materials can be grown. New varieties are constantly being introduced by commercial nurseries, and many of these deserve a spot in the shrub garden. Introduction of new species or varieties into a planting gives an added stimulant that can make shrub gardening an interesting as well as a serviceable beautification project.

SHRUB SPECIES NOTES ²

The notes on the shrub species include statements as to where the species are native and on their size, form, use in landscaping, propagation, and behavior on the southern Great Plains.

Technical terms have been avoided, since it is hoped that the information will be used by those who are not necessarily familiar with technical botanical terms. The statements relative to the behavior of the species are based on the data thus far accumulated and on such observations as have been possible; they should not be interpreted as being entirely conclusive. Many species of shrubs need to be observed on a particular site for 10 to 20 years, and in numerous cases recommendations even from data so obtained might be changed as a result of insect infestations, diseases, or unpredictable climatic conditions that might be experienced. It should be emphasized that the species notes apply only to the southern Great Plains as previously defined.

GLOSSY ABELIA

(*Abelia grandiflora* (André) Rehd.)

Glossy abelia, a hybrid of two native Chinese species of *Abelia*, has long been a favorite half-evergreen shrub for planting in the South. Growing into a very attractive shrub 3 to 6 feet in height, it flowers almost continuously during the summer and into the fall. On the southern Plains it is useful south of latitude 33° N. At the United States Big Spring Field Station, Big Spring, Tex., it has made an exceptionally fine shrub, and attempts to grow it have been made in west Texas as far north as Amarillo and Perryton. In these towns it has survived under protection and made a fair showing, but it should not be depended upon over a long period under average conditions. Along the eastern part of the southern Great Plains in Oklahoma as far north as Enid, it can be grown on protected sites with some degree of success. At Woodward it has failed to survive in nursery rows in repeated tests. Propagation of glossy abelia by green-wood cuttings under glass is comparatively easy.

ADINA

(*Adina rubella* Hance)

Adina is a rather recent introduction on the southern Great Plains. Received in 1938 from the Division of Plant Exploration and Introduction, it has undergone only preliminary testing at Woodward and has been distributed to only a few counties. It was described by the Division of Plant Exploration and Introduction as follows:

A vigorous, much-branched shrub. The small opposite leaves are dark glossy green with a reddish tint and with a pronounced reddish color when young. The dense heads of small flowers resemble those of the American button-bush, *Cephalanthus occidentalis*, to which this plant is related.

During the time adina has been at Woodward it has developed into an attractive bush 5 feet in height. It has survived rather severe winters and has been only partially injured. If cut back to the ground, it makes a quick, lush growth with very shiny dark-green

² Shrubs arranged alphabetically for Latin names.

foliage. The bloom is unusual, but not especially valuable. The species is almost evergreen at Woodward. Propagation has been by late-fall green-wood cuttings treated with rooting substances. Further testing is warranted in that part of the area south of latitude 33° N.

SERVICEBERRIES

(*Amelanchier* spp.)

Seven species and one horticultural variety of *Amelanchier* have been tested at the Woodward station. Of the group shadblow serviceberry (*Amelanchier canadensis* (L.) Med.) and Success serviceberry are the only two that show any promise.

Shadblow serviceberry is a small, irregular tree up to 30 feet in its native habitat in the eastern part of the United States, but it has not exceeded 12 feet in height and has been of a bush form on the southern Plains. It cannot be classed as being very drought-resistant, and it develops into a good bush and produces fruits only when supplied with some irrigation. The white flowers appear before or about the same time as the leaves in the spring and individually are not especially attractive; but because of their density mature bushes are interesting in early spring. The dark-red berries are rather showy and are generally relished by children and birds. Shadblow serviceberry must be confined to sites where considerable additional moisture is available and should be used only as an occasional shrub. Propagation is most easily accomplished by divisions.

Success serviceberry is a low-growing shrub, which has not exceeded 3 feet in height at Woodward. It is not especially attractive and is interesting only because its fruits are comparatively large and of much better quality than those of the ordinary shadblow serviceberry. This variety should be limited to three or four bushes in the corner of the garden where they can get the benefit of irrigation.

LEADPLANT

(*Amorpha canescens* Nutt.)

Leadplant, a native of the eastern part of the southern Great Plains, is a low-growing shrub, up to 4 feet in height. It has decidedly gray-green foliage. The flowers are produced in midsummer, are of an attractive blue color, and are borne in spikes several inches long. In order to induce bushy, compact growth, leadplant should be pruned back severely. Its survival on apparently adverse sites has indicated that it has considerable drought resistance. Tests at the Woodward station and in 23 counties scattered through the southern Great Plains have proved its adaptability to a wide range of soil and moisture conditions. Propagation is comparatively easy by seed.

INDIGOBUSH AMORPHA

(*Amorpha fruticosa* L.)

Indigobush amorpha, also called false-indigo, is native to the creek bottoms along the eastern fringe of the southern Great Plains. On its native site it makes a large, open-growing shrub. In plantings at the Woodward station, it maintains this characteristic open-growing habit and must be pruned back to the ground level every 2 or 3

years or it soon grows out of bounds. For best development it requires considerable moisture. The tests indicate that it should be used only in park or other community plantings where heavy masses of material are desired.

DWARFINDIGO AMORPHA

(*Amorpha nana* Nutt.)

Dwarfindigo amorpha is native as far west as the Rocky Mountains and should be used more freely than it is in farmstead plantings. It is of interest primarily because it develops into a very small shrub, 12 to 18 inches in height, and has dense compact foliage made up of small, dark-green leaflets. Tests conducted under dry-land culture since 1936 indicate that it is fairly drought-resistant. Propagation is by seed.

WRIGHT ANISACANTH

(*Anisacanthus wrightii* (Torr.) Gray)

Wright anisacanth (fig. 2) is native from central Texas southward. It is distinctly a warm-climate shrub. Its experimental range has



Figure 2.—Wright anisacanth, a small, compact shrub that likes the hot sun of the southern Plains.

extended as far north as Garden City, Kans., where 5-year-old plants reach a height of about 18 inches and produce a fair showing of bloom. Farther south at Dalhart, Tex., and Tucumcari, N. Mex., Wright anisacanth makes more vigorous and correspondingly greater height growth. At Big Spring, Tex., it reaches a height of about 4 feet and is very free blooming. In the warmer parts of the area it produces a multitude of slender, tubular flowers of a rather striking orange-red color, and the bloom may extend from July throughout the remainder of the summer, depending upon weather conditions. Tests indicate that Wright anisacanth is very drought-resistant and can be used rather freely on farms in the warmer, drier sections. Propagation of plants by use of cuttings under glass is comparatively easy.

OLDMAN WORMWOOD

(*Artemisia abrotanum* L.)

Oldman wormwood, an introduction from Europe, has found considerable use on the northern and central Plains. It has been found to be useful only at the higher elevations on the southern Plains. At Tucumcari, N. Mex., it makes a vigorous growth, about 2 feet high, and has a tendency to spread. At Woodward it has behaved very indifferently, growing rather vigorously for a few years and then gradually losing vigor with each successive year. Its value as an ornamental low shrub lies in the light-green color of the finely cut foliage and its aromatic fragrance.

COMMON SAND SAGEBRUSH

(*Artemisia filifolia* Torr.)

Common sand sagebrush of the southern Plains has always been ignored in farm plantings. The average plainsman has become accustomed to seeing mile after mile of rolling sand hills covered with sagebrush and associates its character of growth with that seen so often in the wild. In its native state sagebrush usually has considerable small, twiggy deadwood, and the plant assumes a dull-gray rather desiccated appearance in late summer and fall. In early spring when new leaf growth is being developed, the entire plant has a very attractive silvery-green appearance. The pungent sage odor that is very pronounced at night or in early morning, when the plants are covered with dew, is an unforgettable memory. The lowly sagebrush earned considerable respect from cattlemen because of the role it played during the severe drought of the 1930's in protecting small clumps of grass which might otherwise have perished. Tests of the species as an ornamental at Woodward indicate that it can be a useful border plant in group plantings on sandy sites. It should be pruned back severely every few years so that new growth will develop.

JAPANESE BARBERRY

(*Berberis thunbergii* DC.)

Japanese barberry has been tried repeatedly over the entire southern Great Plains. At the higher elevations on heavier soil it has a limited use, but it has not been satisfactory in the Woodward district, particularly on sandy sites. On the southern Plains it has been a relatively

low-growing shrub, up to about 3 feet in height, with a rounded, compact form. During fall and early winter the small red berries add a flash of color to the landscape. Japanese barberry is subject to chlorosis. On the southern Plains it is suggested as an occasional specimen in foundation or group plantings. Japanese barberry does not harbor black stem rust of wheat, oats, barley, or rye. It should not be confused with the native barberries, which cannot be used where cereals are grown, because they are hosts of the rust.

BUTTERFLYBUSHES

(*Buddleia* spp.)

The principal species of *Buddleia* are native to China, and numerous selections have been made in various parts of the United States. Because tests of this genus started in 1933, data are still very limited. New types are being introduced by commercial growers every season, and promising ones are being added to the testing blocks. Blooms of butterflybushes are borne in panicles that resemble lilac blooms. Most of them are lavender or purple. Since butterflybushes bloom during midsummer, they have justifiably been given the common name "summer lilacs." This characteristic of blooming in middle and late summer more than compensates for the trouble of pruning back to the ground each year. Propagation is by green-wood cuttings in summer or mature-wood cuttings in late fall under greenhouse conditions. All butterflybushes have been rather difficult to transplant in the area. The difficulty is probably due to the effect of the local environment on the plants.

Fountain butterflybush (*Buddleia alternifolia* Maxim.) is the only one of the butterflybushes so far tested that does not have to be pruned back to the ground each year at Woodward. It grows to a height of more than 12 feet and becomes a large, widespreading bush with pendulous branches. Another characteristic which separates this species from all other butterflybushes is the light-green foliage, made up of comparatively small, narrow, willowlike leaves. Owing to its large size, fountain butterflybush should be planted as a background or screen-planting shrub. It responds to close pruning and makes a fair hedge.

Oxeye butterflybush (*Buddleia davidi* var. *magnifica* Rehd. & Wils.) (fig. 3) is similar in habit of growth and general appearance to the Ile de France variety except that it tends to make a smaller bush with more spreading branches. Plants cut back during the winter make a height growth of about 4 feet each growing season. The bloom is classed by some as violet purple and by others as deep rose purple in color. It has a deep-orange eye. In any case, oxeye butterflybush does have a pleasing purple color, the density of which may vary with site. Observation of behavior on 90 sites in more than 50 counties in the southern Plains area has shown that oxeye butterflybush can be used to advantage in foundation, border, and screen plantings.

Ile de France butterflybush (*Buddleia davidi* var. *wilsoni* (Wils.) Rehd. & Wils.) carries deep-purple panicles of bloom from the middle of June until late in the growing season. During mild winters it behaves like a woody shrub, but since it usually partially or entirely kills back to the ground, it is handled as a herbaceous perennial and



Figure 3.—Blooming oxeye butterflybush about 4 feet in height and with an informal spread of 5 feet, growth all made during the current year.

pruned back each year. Established plants become shrubs up to 5 feet in height in one season at Woodward and bloom very freely. In cooperative experimental plantings the Ile de France variety has shown considerable drought resistance and has had an excellent showing of bloom. South of 33° N. latitude it behaves like a woody shrub. The blooms are valued as cut flowers at a time of the year when most other shrubs are void of blooms. As a specimen in an out-of-doors living room, the Ile de France variety can be a real source of pleasure.

Farquhar butterflybush (*Buddleia farquhari* Farrington) has made fairly vigorous growth in testing blocks since 1935, but it has not made such an attractive show in bloom as some of the other butterflybushes. The blooming starts in early summer and continues until frost, but the panicles are only partly filled at any one time. Juvenile plants make fairly rapid growth. Cuttings rooted in the greenhouse during the winter and lined out in the nursery in the spring will average nearly 3 feet in height at the end of the first season. Because the branches are tender as far north as Woodward, it is necessary to cut Farquhar butterflybush back to the ground each season.

Lindley butterflybush (*Buddleia lindleyana* Fort.) can be classed as a secondary shrub at the Woodward station. The lavender blooms start in June and continue during most of the growing season, but the lavender panicles are never as attractive and as full of blooms as those of either the Ile de France or the oxeye variety. Some seasons the wood is winter-hardy, but winter hardiness cannot be depended on.

If Lindley butterflybush is not pruned back to the ground each season, considerable small-twigg growth which has died back is always very evident. Tests being continued in the area indicate that its use in the southernmost part of the Plains is possible.

BIRD-OF-PARADISE

(*Caesalpinia gilliesii* Wall.)

Bird-of-paradise, an introduction from South America, has been used rather commonly in the southern part of Texas and has become naturalized in limited districts. It has been distributed throughout the southern Great Plains. In the northern part of the area it behaves like an annual. At Woodward it very often kills back to the ground, but makes a very quick recovery. From midsummer until fall it is covered with light-yellow flowers with very brilliant red stamens. Because the bloom is unusual and striking in appearance, the species has had rather widespread use in the warmer parts of the southern Great Plains. In the central part of the area it develops into a shrub 2 or 3 feet in height from seed planted in the spring. Older plants cut back to the ground each winter often make a seasonal height growth of 4 to 5 feet. Bird-of-paradise is suggested for use in screen plantings on rather adverse sites. By soaking the seeds until they begin to swell and planting them immediately thereafter, germination can be hastened considerably.

BEAUTYBERRIES

(*Callicarpa* spp.)

Purple beautyberry (*Callicarpa dichotoma* (Lour.) K. Koch) is a shrub about 4 to 5 feet in height that is native to eastern Asia. The genus is interesting mainly because of the very showy fruits. Of the seven species and varieties tested, including the more common American beautyberry (*C. americana* L.), the only one that has survived and made a fair showing of fruit at Woodward has been the purple beautyberry. The last, growing under nursery-row conditions since 1938, has a height of 46 inches and has produced fruit every season. It should be limited to protected sites where it can be watered. In dry-land tests all the beautyberries failed to survive.

SIBERIAN AND OTHER PEA-TREES

(*Caragana* spp.)

Siberian pea-tree (*Caragana arborescens* Lam.), native to Siberia, has a place at the higher elevations of the southern Great Plains. In northeastern New Mexico it develops into a tall shrub 8 to 10 feet in height and produces yellow blossoms in early summer. The seeds are produced in pods; an unusual characteristic of the Siberian pea-tree is that the seed pods when mature burst open rather forcefully and a scattering of the seeds results.

Other pea-trees under observation at the Woodward station include dwarf pea-tree (*Caragana aurantiaca* Koehne), Russian pea-tree (*C. frutex* (L.) K. Koch), littleleaf pea-tree (*C. microphylla* Lam.), pygmy pea-tree (*C. pygmaea* DC.), and sophoraleaf pea-tree (*C.*

sophoraefolia Tausch). Of these, dwarf, littleleaf, and pygmy pea-trees show the most promise.

Propagation of pea-trees is mainly by seed.

COMMON BLUEBEARD

(*Caryopteris incana* (Thunb.) Miq.)

Common bluebeard is a recent introduction into the southern Plains from eastern Asia. It is a small, compact, very rounded shrub, which is covered with small blue flowers from the middle of August until frost. It has been distributed for observation in 41 counties. Its response has been rather erratic. At Woodward common bluebeard has killed back through the roots, whereas in counties in the upper Texas Panhandle and eastern New Mexico it has survived and made very vigorous growth. At Tucumcari, N. Mex., it develops to a height of more than 3 feet and has a spread of 3 to 4 feet. It makes an excellent low shrub for foreground use in mass shrub plantings or as a low natural hedge. In the northern part of the area it could justifiably be handled as an annual because of its free-blooming character. Like all the other bluebeards it has foliage with a peculiar pungent fragrance, which is easy to remember once one has noticed it. Propagation of common bluebeard is by green-wood cuttings under glass.

MONGOLIAN BLUEBEARD

(*Caryopteris mongholica* Bunge)

Mongolian bluebeard has been growing at the Woodward station for the past five seasons only. It has developed into a small shrub about 18 inches in height with open-growing branches and scattered blooms, which are not as intensely blue as those of *Caryopteris incana* or *C. tangutica*. Further testing of this species is warranted, in order to determine whether it can be used in place of *C. incana* in the more northern part of the southern Great Plains.

BLUE "SPIREA"

(*Caryopteris tangutica* Maxim.)

Blue "spirea" is a name given this species by commercial nurserymen. It was obtained from the Division of Plant Exploration and Introduction in 1932. Some authorities do not recognize it as distinct from *Caryopteris incana*. In tests so far made at the Woodward station and in 69 counties besides Woodward throughout the southern Great Plains, two distinct differences in character of growth have been noticed. Common bluebeard has a distinctly compact, rounded type of growth, whereas blue "spirea" is more irregular in outline, always having a number of canes that extend beyond the average height of the shrub. Another striking difference is that blue "spirea" tends to have long, running basal twigs which layer very readily. Common bluebeard has never reproduced naturally by layering of twigs at Woodward. Tests have indicated that blue "spirea" is superior from the standpoint of winter hardiness. *C. tangutica* and *C. incana* bloom at about the same time, and there is very little difference in color of bloom. The suggested use of blue "spirea" in plantings is the same as that of common bluebeard.

CEANOTHUS

(*Ceanothus* spp.)

Inland ceanothus (*Ceanothus ovatus* Desf.) is not as showy as the more eastern species, Jersey-tea (*C. americanus* L.). Inland ceanothus is native to the eastern part of the southern Great Plains, being found in the sand hills. On its native site it grows to about 24 inches in height, has lustrous leaves, and produces slender terminal axillary panicles of yellowish blooms from midsummer to fall. Inland ceanothus would be an excellent small border shrub if it could be transplanted more easily. Experience in handling bare-root plants suggests that it should be handled in pots or cans. Propagation is comparatively easy by seed.

Jersey-tea has not been winter-hardy at Woodward. Fendler ceanothus (*Ceanothus fendleri* Gray) was likewise proved to be tender. Fifteen other species of *Ceanothus* have been tried, and all except inland ceanothus have so far proved to be ill-adapted to local conditions.

COMMON BUTTONBUSH

(*Cephalanthus occidentalis* L.)

Common buttonbush is native throughout most of the United States. It is confined, however, to moist sites. In the Woodward district it is found along stream courses or in depressions in sandy land where there is an accumulation of moisture. On such sites it grows to 10 to 12 feet in height and becomes an open-growing bush. Under cultivation it can be developed into a fairly compact shrub by cutting it back severely to produce more stem development. It is characterized by the shiny leaves and the small buttonlike seed heads which persist throughout the winter. Buttonbush can be used in heavy mass or screen plantings, but it is too coarse to be used in limited foundation plantings. The species has not been used for general distribution over the area, because of its rather poor usefulness in general plantings. Its behavior at Woodward indicates a fair degree of drought resistance under clean cultivation. Propagation is by stratified seed and by seed sown in the fall.

EASTERN REDBUD

(*Cercis canadensis* L.)

Eastern, or American, redbud (fig. 4) is usually considered to be a small tree, growing more than 20 feet in height. It is, however, very useful in landscape borders and screen plantings as a shrub. By merely pruning back the main stem in its juvenile stage, the species can be developed into an excellent many-stemmed shrub 10 feet or more in height. On many sites on the southern Great Plains redbud makes very slow growth, and handling the species as a shrub rather than as a tree has been logical. Redbud is native to the fringe forests in the canyons and draws along the eastern border of the southern Great Plains, and recently widespread publicity about its beauty in early spring has stimulated the use of wildings over a wide range. Since the species has a rather long, coarse root system with only a relatively small number of fine feeder roots near the main stem, transplanting

large wildings has been rather discouraging. The best policy is to obtain transplants or root-pruned specimens from commercial growers, thereby not only tending to preserve wild trees in their native habitat



Figure 4.—Blooming eastern redbud.

but insuring more favorable results in transplanting. The appearance of the bloom of the redbud is a sure sign of spring, and the small pea-like flowers borne in clusters along the stems and branches make it distinct from any other plant on the Plains. Soon after the blossoms burst, they have a delicately shaded rosy-pink color, which in a few days begins to turn to purplish red.

Distribution of redbud for testing has been made to 178 sites in 73 counties in the southern Plains area. The species has made vigorous growth as far west as the foothills of the Rocky Mountains on all sites where sufficient moisture is available. The chance of spring bloom decreases as the range is extended to the higher elevations, where there are late-spring freezes. Redbud cannot be considered as being very drought-resistant, but it responds in proportion to the care given it, particularly to the water.

Propagation is comparatively simple by planting seed in the fall and by planting treated or stratified seed in the spring.

TEXAS REDBUD

(*Cercis reniformis* Engelm.)

Texas redbud has been under observation since 1935. In a test planting where this species and the eastern redbud were adjoining plants, there has been no apparent difference in their drought resistance. Texas redbud has glossy, thick, leathery leaves, while eastern redbud has dull-green, thin leaves. The small blooms are darker in color than those of the eastern redbud, and they tend to be borne on heavier branches. The general form of the Texas redbud is open vase, while the eastern redbud is usually an irregular, rounded-top specimen. The species bloom at the same time and are often injured by late-spring freezes. Propagation of Texas redbud is the same as that of eastern redbud.

TRUE MOUNTAIN-MAHOGANY

(*Cercocarpus montanus* Raf.)

True mountain-mahogany, native to the Western States, is the most promising of the several mountain-mahoganies that have been tested as ornamentals. In its native habitat true mountain-mahogany grows to 12 or 15 feet in height on favorable sites, while on dry hillsides it generally grows to 6 or 8 feet in height and has an upright form. Under cultivation it has been very slow in rate of growth; while it persists under dry conditions, it does not make rapid enough growth to warrant very general use. Propagation is by seed planted in the spring.

FLOWERING QUINCE

(*Chaenomeles lagenaria* (Loisel.) Koidz.)

Flowering quince has been used very commonly because of its show of bloom in early spring. Blooms of the various varieties range in color from white to brick red. As a result, there has been considerable confusion of varieties in the commercial trade. At Woodward there has been noted a decided advantage in vigor of the pink-blooming variety over those of shades of deep orange red. The pink-blooming variety has been more free blooming and has shown

considerably more vigor, but it is entirely possible that a more vigorous form of the dark-blooming variety will be found. Growing in an irregular form 4 to 6 feet in height, flowering quince makes an excellent medium-sized shrub for specimen or group plantings. On alkaline soils on the Plains it develops a chlorotic condition that can be corrected by the use of iron sulfate.

DESERTWILLOW

(*Chilopsis linearis* (Cav.) Sweet)

Desertwillow is also called flowering willow, flore de mimbre, and willow-leaved catalpa. It definitely is not a willow, but belongs to the same family as trumpetcreeper and catalpa. It is native to southwestern Texas westward to southern California and southward into Mexico. Several types of the species have been collected from various parts of its native range. Often desertwillow has linear, long leaves of a grayish-green color and flowers ranging from nearly white to lavender. Generally it is an open, irregular bush or small tree. The type now being distributed in experimental cooperative plantings has comparatively wide, short leaves of a dark-green color and distinctly dark rose-lavender blooms. This type is more valuable than others for both windbreaks and ornamental use. As a border row in a windbreak, it has the combined characteristics of being very drought-resistant, blooming freely, and not leafing out until late in the spring. Because of the last characteristic this species generally escapes any severe sand injury from early-spring blowing. When it is used as specimen plants or in mass screen plantings, a larger amount of bloom can be obtained by cutting the plants back to the ground every few years.

Since desertwillow is native to the more temperate parts of the Southwest, its northward range is limited. Along the northern boundary of the southern Great Plains, namely the Arkansas River Valley in Colorado and Kansas, it has been under test since 1932. It was killed back rather severely as a result of winter injury during two seasons, but it made a quick recovery and soon regained the height lost. It is now under observation in 91 counties and has proved an excellent shrub for screen and mass plantings on open soil. Desertwillow is being used freely as the border-row species in windbreak plantings.

In order to propagate various selections, cuttings must be used. The species has given rather erratic results during the past 10 years. Hardwood cuttings made in early spring and planted immediately in nursery rows have proved much more satisfactory at Woodward than stratified hardwood cuttings. The wide range of results obtained from planting cuttings indicates that wood condition and seasonal weather conditions determine the results.

Propagation by seed is comparatively simple if the characteristics of the plant are kept in mind. Because desertwillow does not do well in shaded positions and makes its most vigorous growth and bloom during seasons of relatively high temperatures, seeding should be postponed until the ground is comparatively warm. During cool, wet springs germination has been very poor. Seeding is usually delayed until about the middle of May, the date depending upon weather conditions. Seeds planted in a wide band in nursery rows have gen-

erally produced seedlings much superior to those grown in a confined seedbed. One-year-old seedlings very often have single straight roots without any appreciable small feeder roots. Nursery transplanting of 1-year-old stock and carrying over for one more season are well worth while. Under Woodward conditions 2-year-old plants are ideal for transplanting. Older stock cannot be handled with as large a relative number of small roots, and the expense of handling and planting is excessive.

COMMON BLADDER-SENNA

(*Colutea arborescens* L.)

Common bladder-senna, an introduction from southern Europe and northern Africa, has been a welcome additional shrub for the southern Great Plains. It makes very rapid growth, reaching a maximum height of about 12 feet if allowed to grow without pruning. There is considerable variation in character of growth, vigor, and color of fruiting pods in this species. The ordinary type has a tendency to become rather leggy and to be open at the base. The foliage is light green, and the leaves have 9 to 13 leaflets. Yellow pealike blossoms are produced in profusion in May, and there are numerous scattered blooms later in the season. The fruits are produced in inflated bladderlike seed pods; hence, the common name "bladder-senna."

Bladder-senna is an excellent shrub for use in mass, screen, border, and hedge plantings where quick growth is desired. In a hedge it can be held to a compact form if it is kept sheared to a height of about 18 inches. If it is kept sheared to a height of 3 feet or more, the basal area is entirely bare of foliage. Bladder-senna has a place in temporary outside rows in windbreaks. Tests indicate that it may not be long-lived on some sites, but the quick results obtained from planting the species warrant its use on adverse sites. From tests made in more than 85 counties in the southern Great Plains area, bladder-senna has proved its successful adaptability at all except the higher elevations in New Mexico. On the latter sites caragana, a species somewhat similar to bladder-senna, can be used. Because of the similarity of the two species, bladder-senna is often mistaken for caragana and by some is often called "caragana of the South."

Bladder-senna can be propagated very readily by seed. When the seeds are treated with sulfuric acid or soaked in water prior to planting, they germinate very readily and produce seedlings, 2 to 4 feet in height in one season, which often bloom in September.

CILICIAN BLADDER-SENNA

(*Colutea cilicica* Boiss.)

Cilician bladder-senna differs botanically from common bladder-senna in only minor features. In comparative tests at Woodward, Cilician bladder-senna has made a slightly better rate of growth and it tends to produce a more rounded, widespreading type of shrub. It also has supported more basal foliage than common bladder-senna. This native of Asia Minor has been under observation at Woodward since 1935 only and has been distributed to only 13 widely scattered counties in the area. Propagation is the same as that of common bladder-senna.

AMERICAN SMOKETREE

(*Cotinus americanus* Nutt.)

American smoketree is native from Alabama and eastern Tennessee to the Edwards Plateau of Texas. In its native habitat it often develops into a small tree 30 feet or more in height. In the limited tests made on the southern Plains, it has developed into an attractive many-stemmed shrub 9 feet or more in height. Unlike common smoketree, its close relative from the Old World, American smoke-tree does not have the showy panicles of fruit that are smoky in effect. The value of American smoketree lies in its inversely egg-shaped leaves of a light-green color in summer that change to brilliant scarlet in fall and in its orange-colored fruits. In comparative tests under dry-land culture at Woodward, American smoketree has not been as aggressive as common smoketree. Slight chlorosis has developed in American smoketree. Control by application of iron sulfate to the soil has been very effective. Propagation is by seed.

COMMON SMOKETREE

(*Cotinus coggygria* Scop.)

Common smoketree (fig. 5), native to the region from southern Europe to central China, has been in cultivation since the seventeenth



Figure 5.—Smoketree growing naturally as a specimen in a border planting.

century. Tests at Woodward and on 180 sites in 72 counties in the southern Great Plains area have proved its adaption to a wide range of soil and weather conditions. Common smoketree should be used freely in border and screen plantings throughout the area.

Common smoketree is unique in that the large feathery panicles of fruit often make a complete shroud over the entire plant in early summer and give it a distinctly smoky appearance for a month or more. Young transplants are often slow in starting, but once they are thoroughly established they send up canes sometimes 3 feet in height in one season. Ten-year-old plants sometimes measure more than 11 feet in height and have just as much spread as height. Propagation is by seed.

PEKING COTONEASTER

(*Cotoneaster acutifolia* Turcz.)

For years Peking cotoneaster has been a favorite shrub in the Northern States. This introduction from China makes an interesting upright shrub 10 feet or more high, has very attractive, dark-green, glossy leaves, and produces small berries that turn black upon maturing. Early tests of this species at the Woodward station proved to be very discouraging, and during the drought years of the 1930's nearly all plants died as a result of drought injury. Since that time, a number have made excellent showings both in dry-land tests and under irrigation in nursery testing blocks. Excellent plants of this species can be found in most parts of the southern Great Plains on sites where some protection is available and irrigation can be furnished. Peking cotoneaster is tolerant to shade, seems to prefer heavy soil, and makes a valuable specimen for use in foundation plantings on the north sides of buildings. It has responded to shearing at Hays, Kans., and makes a very compact hedge. Recent limited tests have been established in 22 counties in the area. Propagation is by green-wood cuttings under glass and by seed.

SPREADING COTONEASTER

(*Cotoneaster divaricata* Rehd. & Wils.)

Spreading cotoneaster is native to China. Tests have been made with the species since the drought years of the 1930's. These have been limited to culture under irrigation and have had wind protection. Spreading cotoneaster has made an excellent rate of growth and produced an abundance of red fruits that persist over a large part of the winter. Distribution has been confined to 14 counties on sites where protection is possible. The species makes an upright shrub up to 6 feet in height and has spreading branches that tend to interlace. Use as medium-height shrubs in front of tall species is indicated. Propagation is by stratified seed.

MULTIFLORA COTONEASTER

(*Cotoneaster multiflora* Bunge)

Multiflora cotoneaster is the most rapid growing species of the genus so far tested. Four-year-old plants have made a height growth of 6 feet and a spread of 9 feet under nursery-row culture. Multiflora

cotoneaster is one of the few species of the genus that bear showy flowers. The blooms are made up of small white flowers borne in loose clusters during the latter part of April. Heavy crops of red fruits are produced. Propagation is possible by green-wood cuttings in early fall under glass and by seed.

CLIFFROSE

(*Cowania stansburiana* Torr.)

Cliffrose, or quinine bush, is native to parts of New Mexico, Arizona, California, Utah, and Colorado. In its native habitat it is generally an evergreen shrub 3 to 12 feet in height. Under cultivation it responds rather easily; 6-year-old plants at Woodward make a height growth of 5 feet and have numerous canes. Cliffrose occasionally defoliates during the winter on this site. The pinnately divided small leaves are light green. Single cream-colored blooms resembling apple blossoms are produced from midsummer until late fall, and these are followed by seeds having long, plumelike tails.

Tests so far made at the Woodward station and at 12 other locations in the southern Great Plains area indicate that the species is not particular as to site. On adverse sites cliffrose has shown considerable vigor and has developed a form that suggests its use as a hedge, border, or screen plant in sections of the area having scant rainfall. Propagation by seed has been successful. Propagation by cuttings, even when growth substances were used, has not proved satisfactory.

BROOMS

(*Cytisus* spp.)

Brooms are not native to the United States, but Scotch broom (*Cytisus scoparius* (L.) Link) has become naturalized in the Northwest and in some of the Eastern States. The genus is native to Europe, chiefly to the Mediterranean region. Of the many species and varieties that have been tested, the only ones having even limited use on the southern Great Plains are spike broom (*C. nigricans* L.) and Scotch broom. Neither of these survives more than a few years at the Woodward station. In the southern part of the area, at the United States Big Spring Field Station, Big Spring, Tex., spike broom plants have been replaced three times without success. Brooms are interesting because of the profuse bloom of the yellow-flowered species and will undoubtedly find more widespread use as ornamentals and erosion plants in areas having less variable weather conditions than those found on the southern Great Plains.

FEATHER DALEA

(*Dalea formosa* Torr.)

Feather dalea is a low-growing shrub found in central and west Texas, in New Mexico, and in Arizona. Some people state that it reminds them too much of the common Russian thistle for them to cultivate it. Because of its very minute leaflets this is partially true in early summer prior to blooming; but when the small purple blossoms cover the entire plant in late summer and fall, feather dalea is a

valuable ornamental. It is very drought-resistant and can be used as a border shrub on difficult sites. Tests have been limited to Woodward and a few other counties in the area. Propagation is comparatively easy by seed.

BLACK DALEA

(*Dalea frutescens* Gray)

Black dalea, or peabush, is native to approximately the southern two-thirds of the southern Great Plains. In pastures it usually is a very low, scrubby-looking shrub having very few leaves. Scrubbiness is mainly due to the fact that black dalea is often very closely cropped by cattle. Under cultivation black dalea has made an excellent response, growing to a height of 2 feet or more and having a spread of 2 to 3 feet. It has many very small branches that bear minute foliage. Several times during the summer the entire bush is covered with very small red-and-white pea-shaped flowers, which give it a pinkish or light-violet color. At the Woodward station and in the 45 counties in which black dalea has been under observation, it has proved to be entirely hardy but rather difficult to transplant. It produces seeds freely and propagates quite easily, but it requires considerable care in transplanting. Because of its small, compact size it can very readily be used as an edging plant. Rather severe pruning each year tends to produce a better form and a heavier bloom.

ROSE DAPHNE

(*Daphne encorura* L.)

Rose daphne is a very compact, low-growing evergreen shrub that produces a series of attractive pink flowers borne in dense heads at the ends of the branches. The species has the most delicate fragrance of the flowering shrubs tested at Woodward. Rose daphne grows to about 15 inches in height and usually blooms in April and again in late September. It is very sensitive to handling and must be moved with a ball of earth. It does not like the usual dry growing seasons of the southern Plains and has been very erratic in behavior. Because of the general attractiveness of the shrub it is well worth trying to establish as a low border plant.

WINTERBERRY EUONYMUS

(*Euonymus bungeanus* Maxim.)

Winterberry euonymus (fig. 6), an introduction from China, is by far the hardiest and most drought-resistant of the many species of *Euonymus* tested on difficult sites on the southern Plains. It is distinctly different from other species of *Euonymus* in that it has a very light green foliage. The leaves are large, 2 to 4 inches in length, pointed, and heavy. Borne on slender petioles, the heavy leaves tend to droop and give the shrub a peculiar limp appearance. The young stems and branches are entirely green, while the older ones are gray. The fruit is a four-lobed capsule, which, when opening in the fall, exposes the bright-red coating of the seed. Just prior to ripening, the seed capsules have an attractive pinkish cast.

Winterberry euonymus develops into a large, rounded shrub. The oldest specimen at the Woodward station measured 14 feet in height and had a spread of 17 feet after growing for 18 seasons on poor sandy soil with only a very limited amount of irrigation. On a protected site, on the north side of a large building where irrigation was available, a 13-year-old plant made a height growth of 20 feet and had a spread of more than 20 feet. Seedlings and transplants grow vigorously. Winterberry euonymus has been furnished to more than 80 counties in the southern Plains area and is making an excellent showing on locations having an elevation of more than 6,000 feet in the foothills of New Mexico to the eastern border of the Plains where the elevation is less than 1,000 feet. On a dry-land site at the Garden City Branch Experiment Station, Garden City, Kans., a transplant had developed into an attractive shrub measuring 5 by 5 feet at the end of 5 growing seasons.

At the Southern Great Plains Field Station under yard conditions, 5-year-old plants that were watered freely developed new cane growth measuring 5 feet in length in one growing season. Winterberry euonymus has proved to be exceptionally chlorosis-free throughout the southern Plains. Propagation can most easily be obtained by seedling in the fall and by planting stratified seed in the spring. Fair results have been obtained from green-wood cuttings treated with rooting stimulants and planted in the greenhouse.

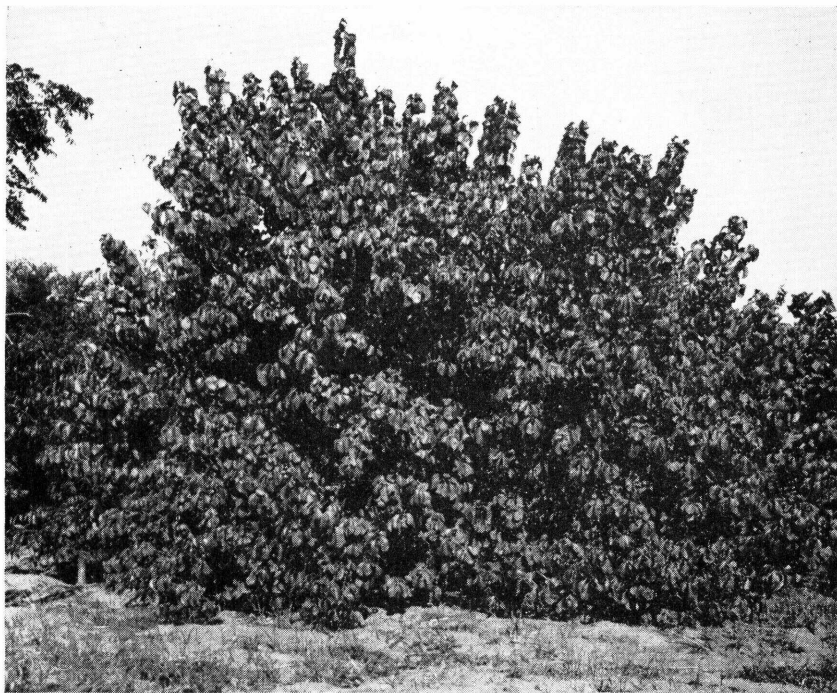


Figure 6.—Winterberry euonymus 10 feet high and with a spread of 14 feet.

EUROPEAN EUONYMUS

(*Euonymus europaeus* L.)

European euonymus, an Old World plant, has had widespread use in the Eastern States for years. Because of its dark-green foliage European euonymus is very effective when planted with conifers. At the Woodward station bloom and fruit are borne only on older plants, eight or more years of age. The capsules open in the winter, showing the orange-colored coating of the seed. If weather conditions in early winter are comparatively mild, the fruits persist for a long period and the shrub is very showy and heavily fruited when other species are inconspicuous. These characteristics warranted rather widespread experimental distribution. European euonymus can be grown successfully in this area when it is given considerable protection and care or on sites where it does not compete with other plants. Results so far indicate that European euonymus is most valuable in the southeastern part of the area and as a secondary species in other sections. Being tolerant to shade, it has found limited use in foundation plantings on the north side of buildings. One use which seems to have been overlooked by many is planting in hedge. A very satisfactory hedge kept sheared to 30 inches or so has been developed in 4 years from transplanted stock. Propagation is the same as for winterberry euonymus.

COMMON PEARLBUSH

(*Exochorda racemosa* (Lindl.) Rehd.)

Common pearlbush has been under observation for 10 growing seasons at the Southern Great Plains Field Station. During this period it has made an excellent show of white blooms in early spring. Young plants have an upright form similar to that of mockorange.

APACHE-PLUME

(*Fallugia paradoxa* (Don) Endl.)

Apache-plume, or ponil, is native to the Southwest, where it is common in the drier mountains and arroyos. It develops to a height of 6 to 8 feet and has a very diffuse branching habit. The finely divided leaves persist during the winter in the southern part of its natural range, but in the Woodward district apache-plume behaves as a deciduous shrub. The very attractive white blooms, similar to apple blossoms, start showing in the first warm days of late spring, and some bloom is always present until frost. The blooms are followed by clusters of seeds having reddish-tinged plumes, accounting for the common name "Apache-plume." Distribution of this species has been to only 23 counties, but on every site so far tested it has responded very readily. In the northern part of the area, along the Arkansas River in Colorado and Kansas, Apache-plume is making as vigorous growth and produces as much bloom as in Quay County, N. Mex., and at Woodward. Some difficulty has been experienced in propagating the species by seed. Rooting cuttings in the greenhouse has also been difficult. Since Apache-plume tends to sprout freely close to the main stems, one can reproduce it on a small scale by merely digging sprouts.

Because of its general light-gray-green color, Apache-plume is not especially valuable in foundation plantings. Its best use is as a screen

plant on difficult sites. When it is used in mass plantings with tamarix, bladder-senna, and desertwillow, the entire planting will make a pleasant summer-long showing. Occasional shearing will improve the general appearance of Apache-plume.

FORTUNE FONTANESIA

(*Fontanesia fortunei* Carr.)

Fortune fontanesia (fig. 7), a shrub native to China, promises to have considerable value on the southern Great Plains. It has shown considerable vigor under dry-land conditions, having attained a height of 12 feet in 11 years. It is compact in form and has slender branches and dense foliage made up of narrow, dark-green leaves that very often persist until late December. This character makes it very useful for heavy corner foundation plantings and border mass plantings. It has responded very readily to shearing and has made one of the best



Figure 7.—Plants of fortune fontanesia showing effects of cutting back.

sheared hedges at the Woodward station. The only successful method of propagation so far found at Woodward has been by cuttings under glass.

NEW MEXICAN FORESTIERA

(*Forestiera neomexicana* Gray)

New Mexican forestiera, also called adelia, tanglebush, New Mexican wild olive, paloblanco, and false privet, is native to the Southwest from western Texas westward. It is usually found as a shrub up to 12 feet in height, but has been recorded as a small tree up to 20 feet in height. In its native state it is usually found in clumps that have resulted from sprouting. This character suggests its use for gully-erosion control.

Tests at the Woodward station show that New Mexican forestiera can be made into an attractive sheared hedge or specimen and that it has a definite place in plantings on sites where only a limited number of the more hardy species can be used. The small gray-green leaves are borne on slender stems. The bloom is not especially showy. So far only one fault has been found. During the wet season of 1941 it was subject to an unidentified leaf rust, particularly in a hedge at the Woodward station. Propagation is by seed, cuttings, and divisions.

FORSYTHIAS

(*Forsythia* spp.)

Forsythias have always been of interest because of their cheerful bright-yellow blooms in very early spring. At Woodward the various species and varieties usually start blooming during the latter part of March. This early blooming makes them very subject to injury by freezes, but they escape frequently enough to make them worth while. Of 10 species and varieties of forsythia so far tested at Woodward, 4 have shown considerable promise and have been distributed to cooperative experimental plantings. Border forsythia (*Forsythia intermedia* var. *primulina* Rehd.), showy border forsythia (*F. intermedia* var. *spectabilis* (Koehne) Spaeth), and Fortune weeping forsythia (*F. suspensa* var. *fortunei* (Lindl.) Rehd.) have been more vigorous than Siebold weeping forsythia (*F. suspensa* var. *sieboldi* Zabel). Very little difference has been noted in amount of bloom of the first three on comparable sites. They are all very irregular in form, and under favorable conditions they must be pruned to keep them in place in a planting. This pruning should be done immediately after they bloom. Tests throughout the area indicate that their use should be confined to a few plants on protected sites, where their refreshing bloom in early spring is welcome. As a genus forsythias cannot be considered as being very drought-resistant.

SHRUB-ALTHEA

(*Hibiscus syriacus* L.)

Shrub-althea, or rose of sharon, has been grown in gardens for generations and includes a long list of horticultural varieties of both single and double types. In the many tests made of the various ones on the

southern Plains, the ordinary single-flowered selections have proved to be more adapted. Seedling selections of those having white, pink, or lavender blooms have been made. The species is interesting on the southern Plains because of two particular characteristics: namely, it usually does not leaf out until late spring and therefore escapes early injury by wind and late frost and it blooms during the heat of middle and late summer. It has a preference for heavy rather than sandy soils. On the southern Plains plants that are more than 15 years old measure up to 10 or 12 feet in height and continue to have a blanket of blooms. Shrub-althea makes a fair sheared hedge when kept to about 2 feet in height; if not trimmed too closely, it gives considerable bloom. Results in cooperative plantings indicate that shrub-althea is rather difficult to transplant in the drier parts of the Plains, but that after establishment it is very drought-resistant. It generally has been slow in rate of growth in its juvenile state. Propagation is by seed and cuttings.

KIRILOW INDIGO

(*Indigofera kirilowii* Maxim.)

Kirilow indigo has behaved as an indifferent shrub at Woodward. It grows to a height of 36 inches but often freezes back to the ground. It has been very tenacious, single plants reaching a diameter of 6 feet during an 8-year period. The slender branches support leaves very much like those of black locust and the heaviest bloom occurs during May, but there is scattered bloom throughout the summer. The bloom is made up of pealike rose-color racemes. Tests have been limited to plantings at Woodward, and the results obtained indicate its use should be confined to an occasional plant for its bloom. Propagation is by divisions.

BEE'S JASMINE

(*Jasminum beesianum* Forrest & Diels)

Bees jasmine has been under observation at Woodward since 1933. It has made a very poor showing, needing successive replacement, and has failed to produce as much bloom as winter jasmine. The foliage is made up of light-colored green leaves borne on semiprostrate limbs. The bloom consists of clusters of small pink flowers. The species has never exceeded 24 inches in height and suffers more winter injury than winter jasmine.

WINTER JASMINE

(*Jasminum nudiflorum* Lindl.)

Winter jasmine is the only one of the jasmines so far tested that has proved useful over a large part of the southern Plains. Along the northern limits of the area in Kansas, it has made a slow, deliberate growth and has suffered some winter injury. South of Kansas and Colorado it has done well and is under observation in almost every county where cooperative plantings have been made. Winter jasmine is an introduction from China that develops into a low, very spreading shrub whose long, pendulant branches are dark green throughout the winter. Bloom is very early in the year, usually in February, and

consists of scattered bright-yellow flowers along the branches. Under dry-land culture at Woodward 10-year-old plants have reached a height of 4 feet and have a spread of 10 feet. Winter jasmine propagates very rapidly by layering.

PFITZER JUNIPER

(*Juniperus chinensis* forma *pfitzeriana* Spaeth)

Pfitzer juniper can easily be classed as the most outstanding low-growing conifer for general landscape use throughout the southern Great Plains. Growing to 5 or 6 feet in height and having a spread of 10 to 12 feet when allowed to grow naturally, it can be kept to a smaller size for a number of years by proper pruning. Pfitzer juniper has a very graceful, irregular form, and pruning back entire limbs is much better than terminal shearing as used on upright junipers. Terminal-branch pruning entirely ruins the characteristic type of growth.

The most common uses of Pfitzer juniper are as foreground evergreen shrubs planted in front of tall, upright specimens and as single specimen shrubs to emphasize entryways. Because of the type of growth, it is suggested that Pfitzer juniper be used more freely on farmsteads as a screen planting in service yards or as a border row in windbreaks. Pfitzer juniper makes comparatively rapid growth, 3-year-old rooted cuttings often making a terminal growth of 12 to 18 inches under nursery conditions at Woodward.

WAUKEGAN JUNIPER

(*Juniperus horizontalis* forma *douglasii* Rehd.)

Waukegan juniper is a very low growing trailing type of juniper that has a limited ornamental use on the southern Great Plains. It reaches a height of less than 1 foot and makes a trailing growth of 8 feet or more. The foliage has a pleasing soft gray-blue color. Waukegan juniper has proved entirely hardy under yard conditions at Woodward. Being prostrate, it must be used only in rock gardens, borders of shrub and flower beds, edgings of walks, and terraces. It has recently been distributed to 19 counties for observation under a wide variety of conditions. Propagation by cuttings under controlled conditions in the greenhouse has been comparatively easy. Layering would be possible during favorable growing seasons.

ANDORRA JUNIPER

(*Juniperus horizontalis* forma *plumosa* Rehd.)

Andorra juniper is useful only in ornamental plantings where a low-growing evergreen shrub 12 to 18 inches in height is desired. It has a spreading habit and makes an interesting specimen for rock gardens and edgings. During the summer months the species has a pleasing gray-green color. In late fall it changes to purple. When Andorra juniper is used as a foreground evergreen shrub with taller evergreens, this fall color adds considerably to the planting. Andorra juniper is under observation in 41 counties in the southern Great Plains area. Propagation is by cuttings and divisions.

TAMARIX JUNIPER

(*Juniperus sabina* var. *amariscifolia* Ait.)

Tamarix juniper (fig. 8) has been growing at Woodward since 1931. This variety has not made the rampant growth characteristic of Vonehron juniper, but it is of a more compact form. During the summer it has bright-green foliage and does not show a reddish cast in midwinter. Propagation is by cuttings in the greenhouse.



Figure 8.—Tamarix juniper, a useful foundation shrub or a foreground plant along the edges of heavy masses of evergreen trees.

VONEHRON JUNIPER

(*Juniperus sabina* var. *Vonehron*)

Vonehron juniper (fig. 9) makes very rapid growth under both dry-land and yard conditions at Woodward. It develops an irregular form, spreading to 6 feet and with branches 8 to 10 feet in length. This irregular habit of growth makes it an attractive juniper to use as a border plant for evergreen groups of cedars and pines. The medium-green foliage of spring and summer takes on a slightly reddish cast in midwinter. Favorable results so far obtained at Woodward and observations in a number of plantings throughout the southern Great Plains indicate that Vonehron juniper deserves widespread use in ornamental plantings. Propagation is by cuttings in the greenhouse.



Figure 9.—Vonechron juniper, which needs plenty of room because of its irregular, spreading form.

FOUNTAIN JUNIPER

(*Juniperus virginiana* var. *tripartita* SénécL.)

Fountain juniper is an attractive evergreen, because it is dwarf and has irregular, rather short branches that support heavy, compact, bright-green foliage. It is more difficult to transplant than Pfitzer and Vonechron junipers, but when established it is hardy and vigorous at Woodward. Propagation is by cuttings in the greenhouse.

BEAUTYBUSH

(*Kolkwitzia amabilis* Graebn.)

Beautybush (fig. 10), an attractive shrub native to China, has been given only preliminary tests on the southern Great Plains. During the severe drought years of the 1930's under dry-land culture the species survived and made a weak growth but did not bloom. In recent more favorable growing seasons beautybush has made an excellent recovery, has grown to almost 7 feet in height, and has a spread of 8 feet. The foliage is of an attractive green, and the ribs and border of the leaves always have a slightly reddish cast. The bloom is made up of clusters of small, bell-shaped, pink flowers, produced in early summer. Beautybush is suggested for protected sites where

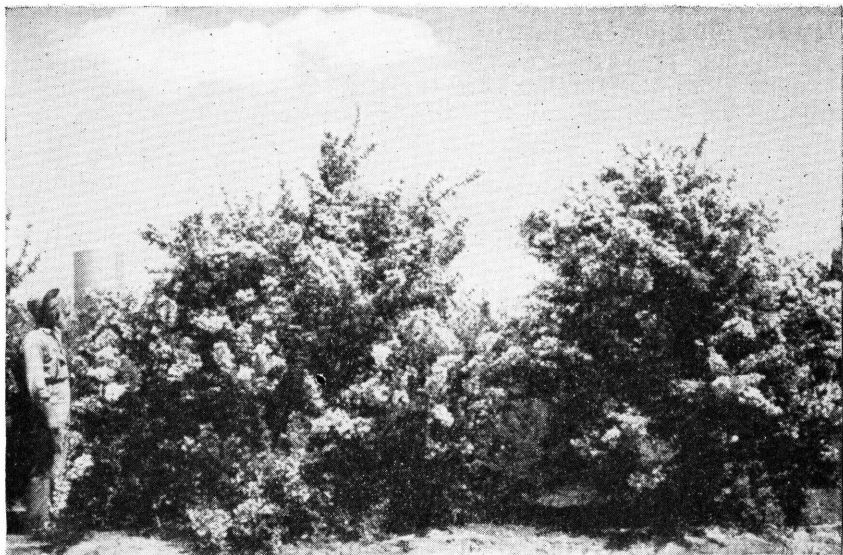


Figure 10.—Heavily blooming beautybushes at the Woodward station.

irrigation is available. At Woodward vegetative propagation has been very difficult even under controlled conditions in the greenhouse.

COMMON CrapeMYRTLE

(*Lagerstroemia indica* L.)

Common crapemyrtle, a native of China, has many characteristics that have earned it a great deal of popularity where the winters are comparatively mild. The heavy masses of bloom are borne in large loose panicles on terminal growth. The various types range in color from almost pure white to pink, lavender, watermelon red, and magenta. Individual blooms are soft and delicate, with petals that are crinkled or crepelike. At Woodward the bloom starts in July and continues into the fall. The species makes a very attractive bush with dense foliage of smooth, semiglossy leaves tinged with a slightly red color. In the Deep South some selections are grown as small trees. Because as far north as Woodward shrubs are often subject to killing back, it is customary to prune them to the ground level each winter. This pruning does not prevent blooming the following season, but seems to increase the amount of bloom. Many southern nurseries recommend severe pruning even in the Deep South, in order to stimulate more bloom.

Crapemyrtle has been tested on more than 275 planting sites in 82 counties. It cannot be used very far north on the southern Plains; but exceptions have been found and plants of the species have survived and made a fair show of bloom as far north as Garden City, Kans. There they make only small bushes and generally kill back to the ground. In Oklahoma crapemyrtle can be used as far northwest as Woodward and Woods Counties; in the Texas Panhandle to Wheeler and Oldham Counties; and in New Mexico at the lower ele-

vations on the east side of the State to Quay County. Continued testing may extend the range of the species even farther northward. Tests under way at Woodward have shown a great deal of variation in amount of vigor and bloom of various selections. Propagation of desirable specimens can be made by hardwood cuttings in the field and by green-wood cuttings under glass.

SHRUB LESPEDEZA

(*Lespedeza bicolor* Turcz.)

Shrub lespedeza is the only one of the genus so far tested that shows any promise of even limited use as an ornamental on the southern Great Plains. It is native to northern China and Japan. At Woodward it has reached a height of 8 feet and has a spread of 9 feet or more, making a rather loose, open, sparsely foliated shrub. Pruning back to the ground every few years is beneficial. The rosy-purple pea-like blossoms are produced in August and September. Limited tests made on 14 sites scattered over the southern Great Plains indicate that shrub lespedeza is a second-rate species, its best use being as an occasional shrub in mass plantings. Propagation is by divisions and by seed.

TEXAS SILVERLEAF

(*Leucophyllum frutescens* (Berl.) I. M. Johnst.)

Texas silverleaf, cenizo, or barometerbush, is native to the trans-Pecos area, Edwards Plateau, Tex., and southward into Mexico. In the warmer parts of Texas it is used very commonly as a hedge, foundation, and specimen plant. Its gray-green or silvery foliage is in striking contrast with many of the very dark green broadleaved evergreens used in the warmer parts of Texas. Because of this boldly contrasting color, Texas silverleaf does not blend with numerous shrub species and should be used with discretion. The bloom is produced in the heat of the summer and is made up of numerous bell-shaped, delicately shaded violet-purple blossoms. Repeated attempts to extend the species northward have been unsuccessful. An occasional plant survives during a mild winter as far north as Woodward. It is suggested for use only in the extreme southern counties of the southern Great Plains. Propagation is possible by cuttings under glass.

PRIVETS

(*Ligustrum* spp.)

Privets have been used universally as hedges for generations. They are valued mainly for green foliage, but might well be used more extensively in group and foundation plantings. A few species are valuable as flowering specimens. Of the many species and varieties tested, those that have proved useful originated in Asia, except for common European privet, which came from Europe and north Africa. Privets are moisture-loving plants, and attempts to grow them on dry-land sites in low-precipitation sections generally result in failure. They develop a bushy, compact mass of roots usually confined to a relatively small area. This characteristic often accounts for the poor results obtained when privets have to compete with vigorous grasses

such as Bermuda grass or with adjacent vigorous shrubs. To develop dense, compact hedges, it is well to plant privets slightly deeper than most other shrubs, cut them back to the ground to induce more cane development, and shear them regularly so that height is gained slowly. Too often a spindly hedge that is very open at the base and merely a shell develops as a result of improper pruning. The form of shearing for a hedge has been the subject of considerable discussion. In order to have an even distribution of light on hedges, the best cross-section form to develop is either a half circle or a broad triangle. Hedges that are sheared in the form of a rectangle or a square tend to be open at the base. Propagation of the more common types of privets is usually by the use of hardwood cuttings.

AMUR PRIVET

(*Ligustrum amurense* Carr.)

Amur privet should be used at the higher elevations and in the northern parts of the southern Great Plains. The foliage is not entirely evergreen at Woodward and is lighter green than that of European and Quihou privets. The privet referred to as Amur River North and propagated by northern nurseries is the one suggested for use in that part of the area where it is useful. Amur privet is not recommended for the southern part of the Plains, since more desirable species, including evergreen ones, are available.

JAPANESE PRIVET

(*Ligustrum japonicum* Thunb.)

Japanese privet is one of the most valuable of the truly broadleaved evergreen privets; unfortunately on the southern Great Plains it has to be confined to the milder parts of the area south of latitude 33° N. It has been distributed for testing in 15 counties. In the Lamesa-Big Spring, Tex., part of the southern Plains the species has been used very freely for a number of years. Repeated attempts to grow this species as far north as Woodward have been unsuccessful.

GLOSSY PRIVET

(*Ligustrum lucidum* Ait.)

Glossy privet, a native of China, Korea, and Japan, and many selections of it are evergreen in the southern counties of the southern Great Plains. In that section the various forms are used very extensively for foundations, as specimens, and in border, mass, and screen plantings. Some of the forms develop to a height of 20 feet, or they can be kept to any height desired by shearing. Their glossy, heavy leaves are always very striking in appearance. Like Japanese privet, the various forms of glossy privet have proved tender as far north as Woodward.

QUIHOU PRIVET

(*Ligustrum quihoui* Carr.)

Quihou privet (fig. 11) differs from other deciduous privets that have been tried in that the leaves are much darker green and more

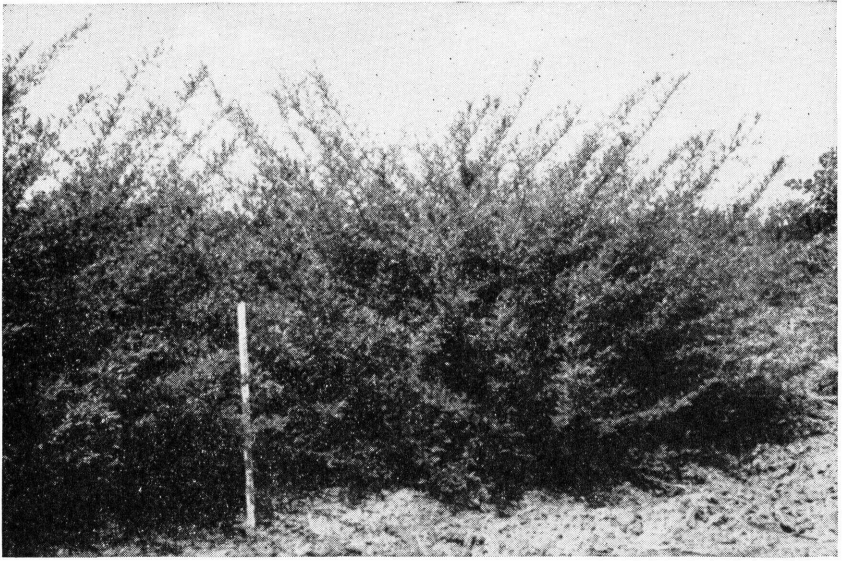


Figure 11.—Quihou privet, which makes its best show when allowed to grow several years without cutting back.

lanceolate. One-year-old plants have often proved tender at Woodward, but older plants have been winter-hardy except for occasional tip injury during extremely severe winters. When grown as a natural hedge Quihou privet makes a splendid show of creamy-white blooms during midsummer and often has a heavy bloom in late fall. By cutting it back every 2 or 3 years it can be kept to medium size as a useful border hedge.

CHINESE PRIVET

(*Ligustrum sinense* Lour.)

Chinese privet has smaller, lighter green leaves than those of other privets so far tested. Because Chinese privet occasionally has been killed back in the northern part of the area, it should be confined to the southern part of the southern Plains.

EUROPEAN PRIVET AND ITS VARIETIES

(*Ligustrum vulgare* L. and several varieties)

Common European privet is being used successfully over the entire southern Great Plains. It has been tested on more than 203 planting sites in 78 counties, and it has developed into a useful shrub on all sites having sufficient moisture. When used as a specimen or as a natural-growing hedge, it develops to 10 feet or more in height and produces panicles of white bloom in early summer. At Woodward the bloom has not been so heavy as that of Quihou privet and it has not persisted for so long a period.

Four varieties of European privet have been tested. Of these, Lodense privet (*Ligustrum vulgare* forma *nanum* (Kohankie) Rehd.) is the only one that shows any especially desirable characteristic that

is superior to the characteristics of the European privet. Lodense privet is a dwarf variety that makes a very slow growth; therefore hedge maintenance is very simple.

WINTER HONEYSUCKLE

(*Lonicera fragrantissima* Lindl. & Paxt.)

Winter, or fragrant, honeysuckle (fig. 12) is an introduction from China that has been valuable on the southern Great Plains. Early tests indicated its value as a desirable ornamental, and it has been distributed to 250 planting sites in 82 counties in the area. These tests have shown that the species should not be grown in competition with very aggressive shrub species unless considerable irrigation is available. Small transplants are very slow in rate of growth, taking 3 to 4 years to develop into fair shrubs; but once a transplant is thoroughly established, the rate of growth is comparable with that of many other common shrubs.

The characteristics which make winter honeysuckle a valuable shrub are its very fragrant bloom and the almost evergreen habit of the thick, dark-green leaves. Blooming usually in March, winter honeysuckle often disregards season and blooms profusely at Woodward at Christmas time. The bloom is made up of small creamy-white flowers which are not showy, but which have a delightful fragrance. During mild winters or on well-protected sites as far north as Woodward winter honeysuckle is nearly evergreen. Under favorable growing conditions it has developed into a large, round shrub 9 to 10 feet

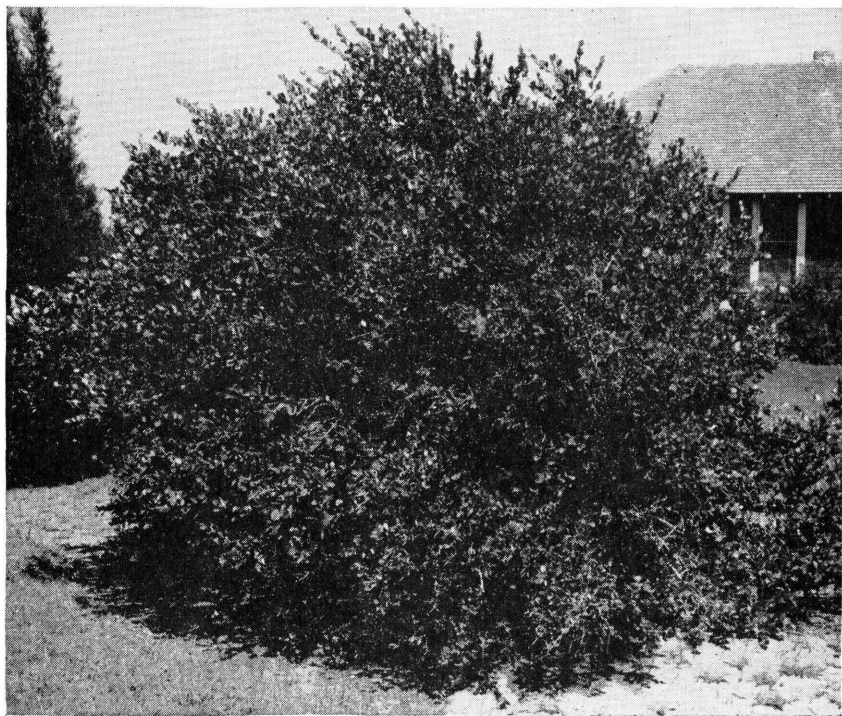


Figure 12.—Winter honeysuckle.

in height. On dry-land sites without irrigation 7-year-old plants have not exceeded 5 feet in height. Propagation is by layering and by either green-wood or hardwood cuttings.

BLUELEAF HONEYSUCKLE

(*Lonicera korolkowii* Stapf)

Blueleaf honeysuckle (fig. 13) was added to the testing blocks at Woodward in 1933. For a few years it showed considerable vigor, but in several cases plants more than 7 or 8 years old began to show early defoliation and gradually weakened and entire branches died. A few plants have persisted, one 12-year-old plant having a height of more than 8 feet and a spread of 10 feet. Blueleaf honeysuckle lives up to its name, since the foliage is decidedly blue green, a showy characteristic that makes the species outstanding among shrubs. Propagation has been very difficult at Woodward, and widespread distribution has not been possible.



Figure 13.—Blooming blueleaf honeysuckle, which has behaved erratically at the Woodward station.

AMUR HONEYSUCKLE

(*Lonicera maackii* Maxim.)

Amur honeysuckle is a native of northeastern Asia and central Japan. Under favorable conditions it reaches a height of 15 feet. Ten-year-old plants in a dry-land test reached a height of 7 feet and had a spread of 9 feet. One very noticeable character of Amur honeysuckle is the very rapid rate of growth of juvenile plants. Of all of the bush honeysuckles so far distributed on the southern Plains, this species has an outstandingly rapid rate of growth immediately after

transplanting. Recent test plantings on 149 sites in 71 counties show a high rate of survival and indicate that Amur honeysuckle has the highest rating in drought resistance among the honeysuckles.

Amur honeysuckle has dark-green foliage that does not assume the dull color so often found in varieties of Tatarian honeysuckle during midsummer. The bloom consists of rather coarse, large white flowers borne in May. Often a scattering of bloom is evident in late summer. The red fruits persist into midwinter.

Owing to its comparatively large size, Amur honeysuckle is suggested for border, mass, and screen plantings rather than for foundation plantings.

Propagation is comparatively easy by use of green-wood cuttings. Seedlings can also be produced by using stratified seed and by planting newly collected seed in a greenhouse immediately after the seeds mature. One-year-old seedlings often average 12 inches in height. By cutting back and transplanting, a vigorous, strong-rooted plant can be developed in two growing seasons.

MORROW HONEYSUCKLE

(*Lonicera morrowii* Gray)

Morrow honeysuckle is an introduction from Japan that has been making vigorous growth in the testing blocks at Woodward. Growing as a spreading bush to a height of 6 feet and a width of 12 feet or more, it makes an attractive specimen shrub. The white blooms are followed by red fruits in midsummer. One variety has yellow fruits. Tests at the Woodward station and in 24 counties indicate that Morrow honeysuckle has a longer seasonal value than Tatarian honeysuckle. The leaves retain their gray-green color throughout the heat of midsummer. The size of Morrow honeysuckle limits its use to border, mass, and specimen plantings. Morrow honeysuckle is rated next to Amur honeysuckle in drought resistance. The easiest method of propagation is layering.

TATARIAN HONEYSUCKLE

(*Lonicera tatarica* L.)

Tatarian honeysuckle has had widespread use on the Plains for a long period. The species occurred in the region extending from southern Russia to Asiatic Turkestan in the middle of the eighteenth century. It has been propagated very freely and many varieties are listed by commercial growers.

Nearly all varieties of Tatarian honeysuckle tested so far have shown considerable value as spring and early-summer shrubs. From midsummer on, however, the leaves assume a dull color, some defoliation is usually experienced, and the plants are definitely less desirable than those of other honeysuckles such as Amur or winter. Tests made in over 50 counties in the past 15 years indicate that this behavior is usual except on sites where considerable irrigation and protection are available.

OREGON GRAPE

(*Mahonia aquifolium* (Pursh) Nutt.)

Oregon grape, or Oregon hollygrape, is native to a limited section in the northwestern corner of the United States. It has been used for

a number of years on the southern Plains and has been added to cooperative experimental plantings in more than 50 counties. Oregon grape has been rather difficult to transplant and is usually very slow in rate of juvenile growth. If it is balled and burlapped and given protection the first year or two, it can be used successfully as a valuable foundation-planting species. It can be grown in either full sun or partial shade, but it makes its greatest development when protected from the hot south winds of summer. At Woodward it is almost evergreen and has developed to 3 or 4 feet in height in plantings in full sun. In partial shade and entirely protected from damaging winds, specimens up to 6 feet in height have been grown. Seedlings vary considerably, from types having very dull gray-green leaves to those that are very dark green and glossy; some leaves have only a few spiny teeth, while others have numerous spiny ones along the edges. There is also considerable variation in density of foliage, autumnal color, and amount of bloom and fruit. The bloom is made up of series of small yellow flowers clustered at the end of the branches. The fruit is a small berry bluish gray in summer and turning black at maturity. At Woodward the plants are usually 6 or 8 years old before much fruit is developed. In late fall and early winter Oregon grape is very showy, the foliage changing to various shades of red. It is suggested for foundation plantings, particularly on the north side of a residence. Propagation is by seed and divisions.

CREeping MAHONIA

(*Mahonia repens* (Lindl.) Don)

Creeping mahonia is native to the mountains from British Columbia, Canada, to New Mexico and California. It differs from Oregon grape in that it is generally lower growing and spreads very readily by sprouts. Creeping mahonia is nearly evergreen at Woodward. A single plant of this species, planted on the north side of a building, spread to a diameter of more than 6 feet in five growing seasons. The greatest height obtained on such a site has been 18 inches. The spreading habit makes the species very useful as a ground cover on protected sites. The bloom and fruits are quite similar to those of Oregon grape. Tests of creeping mahonia have been confined to plantings at Woodward. Propagation by divisions is relatively easy.

NANDINA

(*Nandina domestica* Thunb.)

Nandina is distinctly a warm-climate shrub from central China to Japan. In the southern counties of the southern Great Plains it is an upright shrub with unbranched stems that grow to 6 feet in height. This character of having an unbranched stem with leaves borne only on the terminal growth very often gives nandina a bamboolike appearance. In mild sections the leaves are evergreen, persist for several seasons, and turn purple in winter. In early spring the new leaves are tinged with red when they unfold. At Woodward nandina has been tender when planted on exposed sites, but under protection it makes a fair showing. Nandina should be balled and burlapped for

successful transplanting. It is suggested for use south of 34° N. latitude and along the eastern fringe of the southern Plains.

DUNEBROOM

(*Parrhelia filifolia* Torr. & Gray)

Dunebroom, a native of northern Arizona and New Mexico, is of interest as an ornamental because of its peculiar general appearance and drought resistance. It grows to a height of about 3 feet and is made up of a series of slender, interlacing branches carrying very narrow leaflets. The foliage is light green. The flowers are dull yellow and are borne on spikelike racemes. They are not especially attractive. The foliage has a peculiar pungent odor when crushed. This pungent odor is a sure test for dunebroom. Propagation by seed is comparatively easy.

RUSSIANSAGE PEROVSKIA

(*Perovskia atriplicifolia* Benth.)

Russiansage perovskia, or silversage, an introduction from the Afghanistan and Tibet regions, has been under observation on the southern Plains since 1933. In the latitude of Woodward it has behaved not as a woody shrub, but as a subshrub or as a herbaceous perennial. It is interesting because of its seasonal vigor and the generous bloom made up of whorls of very small, odd blue flowers that carry a distinct mint fragrance. The stems of juvenile plants grow to a height of 2 to 3 feet in a loose, open fashion that makes the form rather sprawling. With each successive year a more distinct, compact series of stems develop to a height of 3 to 4 feet; the terminals support continuous bloom from early July until frost. Several plants of Russiansage perovskia planted close together for mutual support make an attractive showing in a border planting. The species has been grown on more than 70 experimental planting sites. So far it has been successful throughout the area. Its only fault is that it has to be cut back to the ground each year. Propagation is by summer cuttings and divisions.

SWEET MOCKORANGE

(*Philadelphus coronarius* L.)

Sweet mockorange is the most common of the genus *Philadelphus*. History shows it was first cultivated about the middle of the sixteenth century. Growing to a height of 9 to 10 feet in upright form, sweet mockorange produces more fragrant orangelike blossoms than other mockoranges. If it is neglected during midsummer, it very promptly defoliates and becomes an eyesore, but often it manages to survive and recover the following spring. If it is well watered, however, it carries a heavy foliage throughout the season, and its white, fragrant blooms borne in groups are well worth while. Observations in 39 counties indicate that except for the value of the fragrant blooms the species has a secondary rating for general use. Propagation is by green-wood cuttings under glass.

GORDON MOCKORANGE

(*Philadelphus gordonianus* Lindl.)

Gordon mockorange, native from British Columbia, Canada, to Idaho and northern California, has been under observation at Woodward since 1933. The test so far indicates that it is less subject to chlorosis than most of the other mockoranges. The fact that the plants carry a fairly dense foliage throughout may make the species useful. Gordon mockorange has developed very quickly, a 10-year-old specimen measuring 9 feet in height and having a diameter of 8 feet.

VIRGINAL MOCKORANGE

(*Philadelphus virginialis* Rehd.)

Virginal mockorange (fig. 14) is the showiest of the genus. Bearing large double or semidouble blooms in early spring and again at intervals during the remainder of the growing season, it makes a rapid growth and has an upright form. It lacks the compactness of sweet mockorange, since the long canes very often carry only a scattering of leaves. This characteristic and the fact that it grows 12 to 15 feet tall make virginal mockorange best for use in mass plantings where smaller, more compactly foliated plant materials can be used in the foreground. Like other mockoranges, it must be generously watered.



Figure 14.—Virginal mockorange producing profuse bloom.

UMBRELLA PINE

(*Pinus densiflora* var. *umbraculifera* Mayr)

Umbrella pine has been observed as only a single specimen at Woodward. It is a dwarf variety with an umbrellalike head. The specimen is about 24 years old, 7 feet in height, and with a spread of 8 feet across its flat top. The fine foliage, which has an attractive light-green color, has a very pleasing fragrance during most of the growing season. On its present site on a lawn umbrella pine is in direct competition with more vigorously growing conifers and has suffered some defoliation during extremely dry periods in the heat of the summer. It is of interest only as an odd specimen and because of its fragrance. It is not suggested for general use.

MUGHO SWISSMOUNTAIN PINE

(*Pinus mugo* var. *mughus* (Scop.) Zenari)

Mugho Swissmountain pine (fig. 15) is a dwarf coniferous shrub that has found a useful place in plantings on the southern Great Plains. Mugho Swissmountain pine when true to variety is many-stemmed and dwarf and might reach a height of 6 feet or more, but it can be kept to a height of less than 3 feet by pinching back the new "candle" growth each spring. On all sites in the area where it has been observed in foundation or other ornamental plantings, it has been satisfactory. Like other conifers in foundation plantings,



Figure 15.—Slow-growing type (left) and more rapid growing type (right) of Mugho Swissmountain pine. Both specimens are 16 years old.

it has been abused by being planted too close to other plants or by being used too freely. It prefers full light, but it is fairly tolerant to shade and can be used on the north side of a building.

TRIFOLIATE ORANGE

(*Poncirus trifoliata* (L.) Raf.)

Trifoliolate orange, or hardy orange, native to northern China, is useful in the extreme southern part of the area. In the southern counties trifoliolate orange has long been grown as natural or sheared specimens and in hedges. The sharp, long thorns make it useful as a barrier hedge. Trifoliolate orange produces small white blossoms very early in the spring, and these are followed by small orange fruits. The blossoms have only a very slight fragrance, and the fruits are not edible but consist mostly of rind and seeds. On favorable sites trifoliolate orange develops into a large shrub or small tree, but it can be kept to any desired size. At Woodward a single plant in a protected site has survived for more than 17 years. It occasionally winterkills to within a few feet of the base, but it recovers rather easily and in a few years is again 8 to 10 feet in height. Propagation is by seed.

POMEGRANATE

(*Punica granatum* L.)

Pomegranate is very tender at Woodward, the wood killing back to the ground almost every winter. Growing wild in southern Europe, it prefers a mild climate. Even when treated as a herbaceous perennial at Woodward, it is of interest because of the very shiny, lanceolate leaves. It is under observation in the southern tiers of counties in the area and has a limited use in group plantings or as a background for freer flowering shrubs. Where it is hardy it makes a rapid growth, has large orange-red blossoms, and produces large fruits. Propagation is by cuttings.

SCARLET FIRETHORN

(*Pyracantha coccinea* Roem.)

Scarlet firethorn is a native of southern Europe to western Asia. Because of its very showy orange-scarlet fruits in fall and early winter, the species has been tried repeatedly on the southern Plains. All early attempts to establish it at Woodward have been unsuccessful. Recently a selection made by a nursery in central-eastern Kansas has been furnished for testing. This selection has been winter-hardy in that part of Kansas for several years and shows promise at Woodward. It is a broadspreading type of shrub with very attractive foliage. Further trials of this selection are under way. Suggested use is in the southern part of the area.

LALAND FIRETHORN

(*Pyracantha coccinea* var. *lalandii* Dipp.)

Laland firethorn growing on a well-protected site at Woodward for 14 years has made an excellent showing of fruit in early fall and

winter. Extensive winterkilling has been experienced twice during that period, but the plants have made an excellent recovery. Tests of Laland firethorn on exposed sites at Woodward have been unsuccessful. This is a border-line variety which might well be limited to only the southern third of the southern Plains. Propagation is by cuttings in the greenhouse.

COMMON BUCKTHORN²

(*Rhamnus cathartica* L.)

Of the various buckthorns tested, common buckthorn has made the most vigorous growth. This species is native to Europe and parts of Asia. Plants under dry-land culture have developed to a height of 10 feet and a diameter of 13 feet in nine growing seasons. Common buckthorn is very irregular in growth, having numerous crossing branches with spiny branchlets. Common buckthorn has been very prolific in seed production at Woodward, and the branches are often weighted down with large, black fruits in late fall and throughout the winter. Besides being a useful ornamental in border plantings, this species would probably be valuable as a cover and food plant for quail, if planted on good soil in draws and canyons.

Tests with common buckthorn have been limited to the Woodward station. Propagation is by stratified or fall-sown seed.

DAHURIAN BUCKTHORN

(*Rhamnus davurica* Pall.)

Dahurian buckthorn, native to Japan and Korea, is a secondary shrub species that has limited use at the higher elevations of the southern Plains. It has a lower, more spreading type of growth and lighter green leaves than common and glossy buckthorns. Propagation is by stratified or fall-sown seed.

GLOSSY BUCKTHORN

(*Rhamnus frangula* L.)

Glossy buckthorn is the most ornamental member of the genus *Rhamnus* so far tested. At Woodward 9-year-old plants have been rather slow in rate of growth, being only about 5½ feet in height and having a spread of over 9 feet on a dry-land site. Where glossy buckthorn receives more moisture it grows to 12 feet or more in height. It is of interest because of the small round fruits that mature at various dates, so that green, red, and black fruits are evident in late summer and fall. Glossy buckthorn is useful as an occasional ornamental shrub in group, border, and foundation plantings in the higher elevations of the area. At Tucumcari, N. Mex., the rate of growth, vigor, and amount of showy fruits have exceeded those in comparative tests at Woodward. Propagation is by use of stratified or fall-sown seed.

² Certain buckthorns (*Rhamnus* spp.) are alternate hosts of crown rust of oats. With the possible exception of *R. frangula*, buckthorns should not be planted in areas where oats are commonly grown.

LANCELEAF BUCKTHORN

(*Rhamnus lanceolata* Pursh)

Lanceleaf buckthorn is native from Pennsylvania to Nebraska, Iowa, Texas, and Alabama. It has been under observation since 1939 only. The very rapid growth it made in the first few years prompted further planting on dry-land as well as irrigated sites. Lanceleaf buckthorn makes an excellent shrub in mass plantings and could be used in foundation plantings if properly pruned.

ILLINOIS FRAGRANT SUMAC

(*Rhus aromatica* var. *illinoensis* (Greene) Rehd.)

Illinois fragrant sumac is a spreading shrub, usually of greater width than height. In tests at Woodward 8-year-old plants have grown to a height of 7 feet and have a spread of more than 10 feet. The general appearance is somewhat like that of lemonade sumac except that the leaflets are much larger and tend to be shiny on the upper surface. Limited comparative tests show that Illinois fragrant sumac is superior to lemonade sumac as an ornamental. It is suggested for use in border or mass plantings on rather dry sites. Cutting back to the ground every few years is beneficial. Propagation is by seed.

FLAMELEAF SUMAC

(*Rhus copallina* L.)

Flameleaf, or shining, sumac is an Eastern States species that has had widespread use. The large leaves are made up of as many as 21 very shiny leaflets about $3\frac{1}{2}$ inches in length. Flameleaf sumac makes an open bush of irregular outline and 10 to 15 feet in height at Woodward. Large heads of crimson-colored, hairy seeds develop in late summer and persist into the winter. When favorable fall weather is experienced, the leaves change to an attractive reddish-purple color. Flameleaf sumac has been subject to considerable injury by chlorosis and is not recommended except for neutral or acid soils. The species is under observation on 81 sites. Its use should be confined to plantings where the freely sprouting habit of the species will not be objectionable. Propagation is by sprouts and seed.

SMOOTH SUMAC

(*Rhus glabra* L.)

Smooth sumac is the sumac that is found growing in thicket form on moist sites on the southern Plains. It supports large heads of red fruits during the fall and is usually not more than 4 to 5 feet in height in most of the area. Smooth sumac has only limited use as an ornamental because it suckers very freely and quickly becomes a pest on favorable sites.

LITTLELEAF SUMAC

(*Rhus microphylla* Engelm.)

Littleleaf sumac is native to Palo Duro Canyon, Tex., southwestern Texas to southeastern Arizona, and southward. It grows to 6 or 7

feet in height and has an equal spread diameter. It has small, interlaced branches. The foliage is made up of gray-green leaves with very small leaflets. This gray-green color and the very small leaflets make the plant distinctly different from all other species of sumac. Littleleaf sumac also differs from many other sumacs in that it has never shown any tendency to sprout under cultivation. In its native habitat the bush is often completely covered in late summer with small orange-scarlet fruits. If this fruiting characteristic could be depended on under cultivation, littleleaf sumac would warrant more extensive use. As it is, the species must be confined to less prominent positions, such as screen plantings around service buildings. Tests in 55 counties indicate its high degree of drought resistance and the fact that it is rather difficult to transplant. Initial tests have shown that with shearing littleleaf sumac can be developed into a fair hedge that would be very useful on adverse sites. Propagation is by seed.

LEMONADE SUMAC

(*Rhus trilobata* Nutt.)

Lemonade sumac will continue to be known to southwesterners as skunkbush. It is native to nearly all parts of the area, but prefers sandy sites. On such sites it often is the only woody shrub that grows and has played a local major role in controlling wind erosion. Sand often builds up over a clump of lemonade sumac but new growth develops. Attempts to dig native plants on dunes are usually futile, since a series of young sprouts may be attached to old roots, which, in turn, very often go to great depths and are connected to lateral roots. The best method of obtaining plants is to grow them from seed. Lemonade sumac is so common that it often has been overlooked as a species for yard planting. Under cultivation it has a graceful form and supports a heavier foliage than is usual when it is wild. It can be kept to 3 or 4 feet in height by a little pruning and forms a neat, compact shrub. The small fruits would persist through most of the winter if they were not eaten by birds. Lemonade sumac has been successful in the more than 50 counties in which it is being used in cooperative plantings. On extremely sandy sites, where there is always some movement of soil, it would be entirely feasible to plant a solid row of lemonade sumac to act as a sand trap. Such a sand trap would eventually become waste ground, but this would certainly be preferable to allowing the sand to sift into service yards or gardens or around buildings.

GOLDEN CURRANT

(*Ribes odoratum* Wendl.)

Golden currant, native to parts of the Great Plains from South Dakota to Texas, has been useful from the early settlement of the area to the present. The small black fruits make excellent jellies. Golden currant is a rather open growing shrub that occasionally grows to 6 feet in height but more often is found growing in thicket form up to about 4 feet. In early spring the shrub is covered with spicily fragrant yellow blossoms. During early summer at Woodward the species carries a fairly heavy foliage, but as the heat of the summer becomes more intense, the plants often defoliate and by midsummer

the canes are almost bare. The sprouting habit of golden currant has been objectionable, particularly on very sandy sites.

Golden currant can be improved as an ornamental by pruning it back to the ground every few years. Pruning should be done immediately after the blooming period. Golden currant is suggested as a screen planting for service buildings or an occasional specimen in shrub masses where the early-spring bloom will be useful. For fruit production it should be planted in the garden, where the older bushes can be plowed up every few years and replaced by a single row of sprouts. Tests have been conducted in 49 counties, and the species has been successful on all sites except those with extremely heavy soils. As far west as Union and Quay Counties, N. Mex., golden currant has been very vigorous on sandy sites. In Finney County, Kans., in the northern part of the area, it often does not defoliate in midsummer as it does farther south. Golden currant is a host of the destructive blister rust of the five-needled pines and should not be planted near them.

SHRUBBY BLUE SAGE

(*Salvia ballotaeiflora* Benth.)

Shrubby blue sage is native to southern Texas, southern Arizona, and Mexico. It makes an open, rather sparsely foliated shrub of only secondary value. It bears numerous small blue flowers during the summer. More extensive tests are warranted, since the species is very drought-resistant. H. B. Parks, of the Texas Agricultural Experiment Station, stated that it responds readily to shearing and makes an attractive hedge.

AUTUMN SAGE

(*Salvia greggii* Gray)

Autumn sage is native to southern Texas and to Mexico. Its behavior as far north as Woodward has been rather indifferent; the best development was secured south of a line from Hardeman and Lubbock Counties, Tex., to Chaves County, N. Mex. In that part of the area autumn sage develops into a shrub 2 to 3 feet in height and with many slender stems. It produces an abundance of small purplish-red flowers during summer. A more compact form can be developed by severe pruning every few years. The suggested use is as a low border shrub on sites exposed to full sun. Propagation is by cuttings under glass.

CUTLEAF AMERICAN ELDER

(*Sambucus canadensis* forma *acutiloba* (Ellw. & Barry) Schwerin)

Cutleaf American elder is a form of common elder found growing on moist sites in the eastern United States. The leaflets are light green and cut deeply into many fine lobes. The large flat clusters of white blooms, which are very showy in midsummer, are followed by small, edible black fruits. The cutleaf form grows to a height of 6 to 8 feet in miniature tree form. It is under observation in 58 counties and has been successful only on sites having a low pH value. On moist sites it is a showy species useful in heavy mass plantings. Propagation is by cuttings and divisions.

MEXICAN ELDER

(*Sambucus mexicana* Presl)

Mexican elder is native to New Mexico and Arizona and southward. The type being tested on the southern Plains was collected in the town of Folsom, N. Mex. There it was found growing in tree form to a height of 12 feet; it had stems with diameters of up to 6 inches. In Arizona it is reported as growing to about 30 feet in height. In the Woodward district it has grown in shrub form. In its native habitat Mexican elder produces an abundance of edible fruits. It differs from eastern elders in having decidedly gray-green foliage, which makes the species useful as a contrast plant. Unfortunately the species was not available for testing during the severe drought of the 1930's, and so no data on drought resistance have been obtained. Propagation is by cuttings and seed.

SCARLET ELDER

(*Sambucus pubens* Michx.)

Scarlet, or red-berried, elder (fig. 16) has proved to be the most showy of all the elders so far tested. Scarlet elder is native from the Northern States to as far south as Georgia and as far west as Colorado. At Woodward it annually produces an abundance of large white-flowering clusters of bloom in June, followed by red berries. The fruit of this species is not edible. Nine-year-old plants have grown to a height of 7 feet and have a spread of 10 feet. It is suggested as a

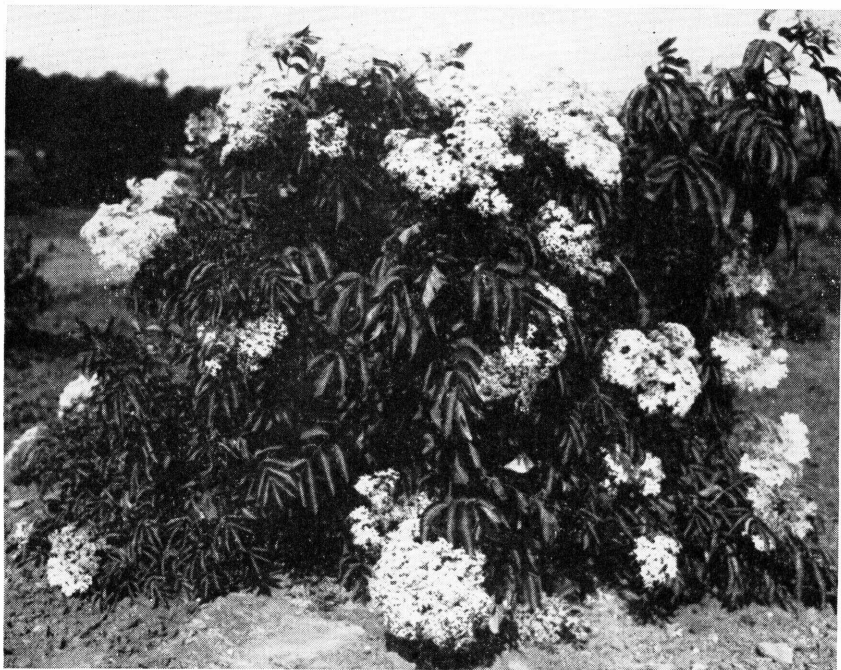


Figure 16.—Scarlet elder, one of the showiest shrubs in the garden in June.

background species in large mass or border plantings on sites where moisture is plentiful. Cooperative distribution has been very limited.

ELDER

(*Sambucus* sp.)

A very dark green elder of unknown source that has been growing for more than 20 years at the Woodward station has been the most vigorous and drought-resistant of the elders. It withstood the prolonged drought years much better than any other species of elder. A 7-year-old plant growing under dry-land culture has developed a height of 7 feet and has a spread of 11 feet. On an alkaline site it showed very little evidence of chlorosis. Because of its apparent vigor, it has been furnished to cooperators for testing in 35 counties throughout the southern Plains. Propagation is by cuttings, seed, and divisions.

LAVENDER-COTTON

(*Santolina chamaecyparissus* L.)

Lavender-cotton is an evergreen subshrub rather than a truly woody shrub. On the southern Plains it rarely grows taller than 16 to 18 inches and has a very symmetrical rounded form. It is native to southern Europe. The grayish-green, almost silvery, foliage is made up of small leaves borne on numerous branches. Because of its low habit of growth and evergreen nature lavender-cotton has found a useful place as a border plant for shrub or flower beds. While lavender-cotton is valued mainly for its foliage, the small yellow heads of bloom produced in June and July stand out very sharply in a planting and increase its value as a border subshrub. Tests in 50 counties indicate that lavender-cotton will kill out at the higher elevations and in the northern part of the area. On such sites it can be used as an annual bedding plant. Propagation by divisions is comparatively easy.

BUFFALOBERRY

(*Shepherdia argentea* Nutt.)

Buffaloberry is a distinctly northern shrub, whose native range is from the northern part of the Great Plains to Kansas. In its native habitat it is an attractive grayish-green shrub or small tree. The edible scarlet-colored fruit is used for making jellies. Attempts to extend the range of the species farther south have been rather indifferently successful.

At Woodward 9-year-old plants have made a height growth of almost 9 feet and have a similar spread, but they lack the vigor and general thriftiness found in plants growing on the northern Plains. It is suggested for the higher elevations in the northwest part of the area. Propagation is by seed.

GARLAND SPIREA

(*Spiraea arguta* Zabel)

Garland spirea, a smaller shrub than Vanhoutte spirea, has very small light-green leaves. It has been very erratic in bloom; when

it does escape late frosts, the blooms persist for only a few days. It should be used only in the southern part of the area, where it can be used in the foreground of shrub masses or foundation plantings to give a light-green foliage effect. Observations in 31 counties have proved that it is very subject to chlorosis on even slightly alkaline soils. Propagation is by divisions and cuttings.

REEVES SPIREA

(*Spiraea cantoniensis* Lour.)

Reeves spirea, one of the parent species of Vanhoutte spirea, has not been of outstanding value in the area. Its habit of growth is similar to that of the Vanhoutte, but it has darker green foliage. Observation of its behavior in 40 counties scattered throughout the area indicates that it is less drought-resistant than Vanhoutte spirea. The leaves often persist until very late in the fall. On the southern Great Plains the use of this native of China and Japan should be limited to protected sites. Propagation is by cuttings and divisions.

DOUGLAS SPIREA

(*Spiraea douglasii* Hook.)

Douglas spirea, native from California northward, has recently been obtained for testing. This spirea has made satisfactory growth, and the showy deep-rose-colored blooms borne in panicles in midsummer make it worthy of further testing. It tends to sucker rather freely and might be useful on moist sites in checking soil erosion.

BRIDALWREATH SPIREA

(*Spiraea prunifolia* Sieb. & Zucc.)

The true bridalwreath spira, native to eastern Asia, is known but little on the Plains. Its behavior has been erratic, and it has not been distributed throughout the area. Blooming very early in the spring, it only occasionally escapes the late freezes. The bloom, which is the most attractive of all the spireas so far used at Woodward, is highly prized for home use. The small, buttonlike pure-white blossoms are borne in long clusters. The small glossy leaves and tall, upright habit of growth make the species unique among the spireas so far tested.

THUNBERG SPIREA

(*Spiraea thunbergii* Sieb.)

Thunberg spirea, an introduction from China and Japan, has found only very limited use in the area. It is one of the intermediate-growing species that can be used as a foreground shrub in mass and foundation plantings in sections having mild winters. At Woodward Thunberg spirea very seldom blooms and usually suffers considerable winter injury. Like garland spirea, it has small, light-green leaves and is very subject to chlorosis.

KOREAN SPIREA

(*Spiraea trichocarpa* Nakai)

Korean spirea has been under observation since 1931 on the southern Great Plains. In habit of growth and type of bloom, it resembles Vanhoutte spirea. The main difference is that Korean spirea generally blooms 1 to 2 weeks later and does, therefore, occasionally escape late-spring freezes. Korean spirea is now under observation on 108 sites in 52 counties. Present indications are that Korean spirea is not so well adapted to as wide a range of soil and climatic conditions as Vanhoutte spirea: its best development has so far been obtained in the southern part of the area. On some of the red-soil sites at Woodward it tends to become weakened and suffers terminal killing back of the small branches. The difference in date of bloom in comparison with other spring-flowering spireas makes it a species well worth further testing.

VANHOUTTE SPIREA

(*Spiraea vanhouttei* (Briot) Zabel)

Vanhoutte spirea is the result of a cross between *Spiraea cantoniensis* and *S. trilobata* L., the first native to China and Japan and the second to the northern China-Siberia region. Very often this species is referred to as bridalwreath, but it should be called Vanhoutte spirea. It is probably the most extensively planted deciduous shrub in the United States. Its adaptability to a wide range of soil and climatic conditions makes it so common that the present tendency in new plantings is to substitute other species. The early bloom, while always welcome in the spring, is very often killed by late freezes.

On many of the soils in the area Vanhoutte spirea becomes chlorotic. Tests indicate that this condition can be controlled best by the use of soil treatments. The technique has not been worked out for all the various types of soils, but on the red soil in Woodward County the application of iron sulfate in solution at the base of the plant has controlled chlorosis for several successive years. The treatment seems to be most effective when applied in early spring.

Vanhoutte spirea can be used successfully for border, screen, foundation, or hedge plantings. It responds more favorably if the old wood is pruned out every year or two. Pruning should follow the blooming period in the spring, and the old canes should be removed at the ground level. Do not prune the canes at a height of 2 feet or more above the ground as high pruning makes the plant tend toward legginess rather than a compact shrub with dense foliage.

At present Vanhoutte spirea is under observation in 89 counties in the southern Great Plains area. It has proved to be satisfactory except on sites where it is weakened by chlorosis.

The fact that this species has been much overplanted at the expense of more desirable species on many urban sites should be recognized, but this need not influence its selection under more adverse conditions in rural plantings. Full realization of its height, type of growth, and season of bloom should tend to temper the use of Vanhoutte spirea so that it will not be monotonous on any farm.

COMMON SNOWBERRY

(*Symphoricarpos albus* (L.) Blake)

Common, or white, snowberry is not native to the southern Great Plains, but it does extend as far south as central Kansas, where it is found growing along stream courses. It is a shrub growing 3 feet in height. It prefers considerable shade for best development. In comparative tests with coralberry, it has been found to be slightly less hardy and to require more moisture. In contrast with coralberry, snowberry produces clusters of almost pure-white fruits, which persist during the winter. The fruits are generally much larger than those of coralberry. Observations so far made in the southern Plains indicate that the species prefers the higher elevations in the western part of the area.

CHENAULT CORALBERRY

(*Symphoricarpos chenaultii* Rehd.)

Chenault coralberry is a recent introduction that has been given only limited tests on 125 planting sites in 61 counties in the southern Great Plains area. It apparently is the result of a cross between pink snowberry (*Symphoricarpos microphyllus* H. B. K.) and Indiancurrant coralberry. It is referred to as new, improved coralberry. In the tests on the various sites at Woodward, it has failed to fruit as freely as common snowberry or coralberry. Chenault coralberry makes a more upright growth than either of the others and has very small leaves borne on arching branches. In general appearance it is much more attractive than other species of *Symphoricarpos*. Chenault coralberry is useful as a border plant or foreground shrub to conceal the bases of taller shrubs.

SPREADING SNOWBERRY

(*Symphoricarpos mollis* Nutt.)

Spreading snowberry has not shown any decided advantage over common snowberry in tests in 14 counties scattered through the southern Great Plains. Its only value is in the large yellow-white fruits, which persist during the winter. The fruits are much larger than those on common snowberry. Tests thus far indicate that it should be confined to sites where considerable moisture is available.

WESTERN SNOWBERRY

(*Symphoricarpos occidentalis* Hook.)

The native range of western snowberry extends as far south as Colorado and Kansas. Western snowberry makes considerably larger plants than common snowberry, growing to as much as 5 feet in height. At the Woodward station it has made especially vigorous growth, 5-year-old plants measuring as much as 3½ feet in height and having a spread of about 4 feet. The leaves are somewhat coarser and larger than those of common snowberry and are rather leathery in texture. During limited tests at the Woodward station the plants have bloomed rather freely and have produced an abundance of white fruits.

INDIANCRRANT CORALBERRY

(*Symphoricarpos orbiculatus* Moench)

Indiancrrant coralberry has long been known as the ordinary buckbrush. It is often listed under the name "*Symphoricarpos vulgaris* Michx." by nurserymen. It is a shrub which has been planted and probably will continue to be very freely planted around farm homes and in parks. It is native to the eastern border of the southern Plains. In that part of the southern Plains where it is not native, it is particularly valuable, because it grows equally well in shade or full sunlight, has adapted itself to a rather wide range of planting sites, and can be used as a low or medium-sized shrub in screen and foundation plantings and in hedges.

The flowers are rather inconspicuous, but the tight clusters of pink to red berries, which are borne along the stems in the fall and during the winter, make it very attractive. Very often the long trailing branches tend to get out of hand, and on sites where considerable irrigation is used the shrub very often tends to take over the entire planting. Indiancrrant coralberry can easily be controlled and kept to the proper size, however, by a limited amount of pruning. Pruning back to the ground occasionally induces more compact branching and seems to stimulate fruit production.

Because of its sprouting habit and the fact that the stems layer so readily, the species is valuable as an erosion-control plant in gullies and washes. For purely ornamental use the rather large fruited types, some of which have decidedly pink berries and others deep-red ones, have been selected from their native site near Woodward and are now used in experimental cooperative plantings. Propagation of selected plants is comparatively easy by cuttings, layering, and divisions.

AMUR LILAC

(*Syringa amurensis* Rupr.)

Amur lilacs have not made vigorous growth in tests at Woodward. After seven growing seasons they have developed to about 3½ feet in height and have a spread of almost 5 feet. Amur lilac is distinctive in that it has much larger leaves than other lilacs and blooms in June and July rather than in early spring. It is recommended as an occasional specimen in border plantings.

JAPANESE TREE LILAC

(*Syringa amurensis* var. *japonica* (Maxim.) Franch. & Sav.)

Japanese tree lilacs (fig. 17) after growing 14 years under dry-land culture measure 11 feet in height and have a spread of 12 feet. This variety can be developed into a small tree. Large panicles of white blossoms are produced in late May and June at Woodward. Japanese tree lilac has made such a vigorous growth at Woodward that it deserves testing extensively throughout the southern Great Plains. Propagation is by cuttings.

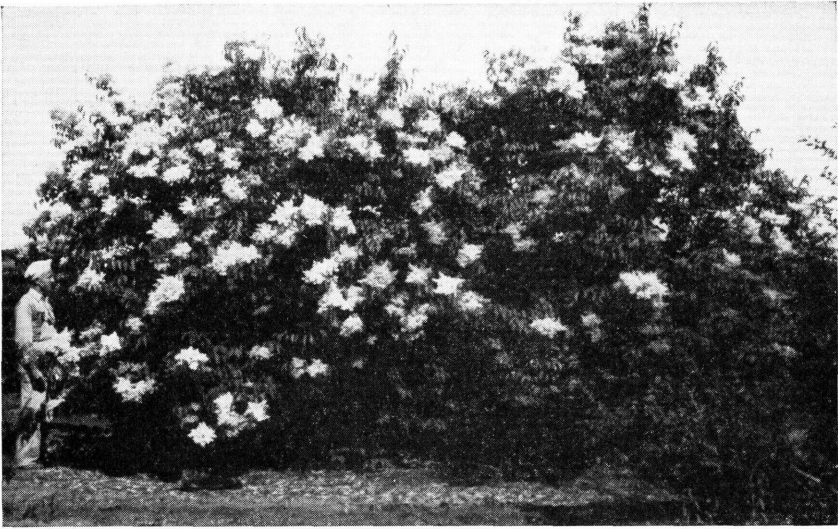


Figure 17.—Japanese tree lilac, which is excellent as a background shrub in border or screen plantings.

CHINESE LILAC

(*Syringa chinensis* Willd.)

Chinese lilac is the result of a natural cross between Persian and common lilacs. History notes that it came from a garden at Rouen, France. Very often it is called Rothamagensis lilac from the Roman name of the town of its origin. The approved common name arose from the onetime belief that it was native to China.

On the southern Plains Chinese lilac has earned the highest rating among the lilacs so far tested. It grows into a large, symmetrical shrub having a series of medium-sized canes and small branches, a 10-year-old plant at Woodward measuring 7 feet in height and 9 feet in diameter. It has not shown any tendency to sprout. Both green-wood and hardwood cuttings from plants grown at Woodward have shown difficulty in rooting. It can most successfully be propagated by divisions. Under more favorable growing conditions in the Eastern States it apparently can readily be propagated by cuttings. Greenhouse cuttings started during the winter and transplanted to the nursery in late spring often make a height growth of 24 inches by the end of the growing season and produce a single spike of bloom in late fall. This certainly gives a negative answer to the often repeated question: "Is it true that lilacs will not bloom until they are 7 years old or older?" Chinese lilac transplants very easily, because it has a bushy root system of numerous, small feeder roots. In amount of bloom it has surpassed all other lilacs on the southern Plains. Tests on 146 sites in 62 counties indicate that it is the most drought-resistant and the most dependable blooming of the lilacs. The lavender bloom is not so large as that of many of the named varieties and it does not have the same degree of fragrance, but it is more frequently in greater abundance year after year. Chinese lilac is adapted to wide use around farm homes. It is equally valuable

as a specimen in foundation, border, or screen plantings; in sheared or natural hedges; and as an outside row in windbreaks at the eastern border of the Plains.

PERSIAN LILAC

(*Syringa persica* L.)

Persian lilac (fig. 18) is recorded as having been in cultivation since the seventeenth century. Originally from China, it has had wide usage in the Old World and has become common in many parts of the United States. Early settlers on the southern Plains brought plants with them from their eastern homes, and many old specimens now

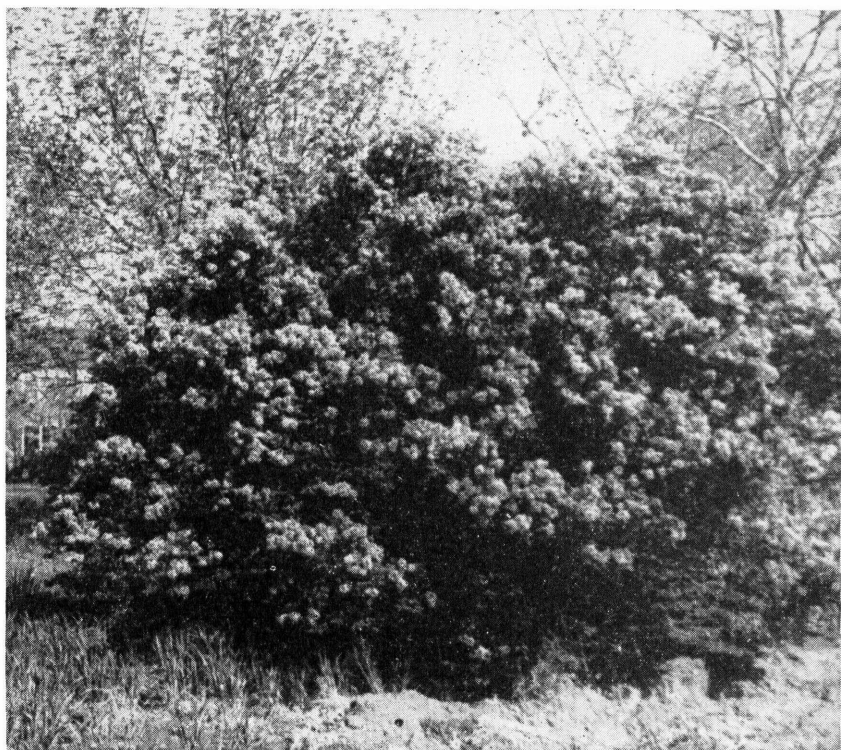


Figure 18.—Persian lilac, which does not have the bad sprouting habit of the common lilac and is usable in all parts of the southern Great Plains.

seen in the area undoubtedly were from these immigrant plants. Persian lilac commonly is the only reminder of some early settler's dream of establishing a homestead. It is very similar in form to Chinese lilac, and the ultimate size is almost the same. Under Plains conditions it has not made as vigorous growth as Chinese lilac, but it is nearly equal in degree of drought resistance.

COMMON LILAC

(*Syringa vulgaris* L.)

Common lilac probably ranks next to Vanhoutte spirea for general use on the southern Great Plains. In most cases it has developed

in bush form, the older plants spreading over a large area and having a height of 4 to 12 feet. Owing to its aggressive sprouting habit, the species has been transplanted very freely. On many abandoned farm sites on the Plains, one often finds clumps of common lilac persisting for many years after the homesteaders have been driven off by drought or other conditions. Very little new growth may be evident, but the species has somehow been able to persist in spite of drought and neglect. There seems to be considerable variation in what is called common lilac. Some types persist in remaining very small and refusing to bloom, while others are taller and bloom more freely. The sentiment often associated with lilac blossoms will continue to be a force in the continued use of the species. For best development common lilac should be watered freely, and under favorable conditions it undoubtedly can be used as an erosion-control species. The species originally came from southeastern Europe and has been under cultivation since the sixteenth century.

HORTICULTURAL VARIETIES OF LILAC

(*Syringa* spp.)

There are hundreds of horticultural varieties of lilac available on the market. To test all of them would be impossible; but 15 of the more common named varieties have been under observation at Woodward for a number of years. Taken as a group, those tested are generally rather coarse-stemmed, medium- to large-leaved, and relatively slow in rate of growth. They range in height from 4 to 8 feet for 11- and 13-year-old plants under dry-land testing. Gardeners who are especially fond of lilacs can select a large list to experiment with, but on the southern Plains they should grow such a collection on sites having considerable wind protection and plenty of irrigation. In the southern part of the area a large number of the varieties escape frost injury, but farther north the late-spring freezes prohibit very much blooming.

KASHGAR TAMARIX

(*Tamarix hispida* Willd.)

Kashgar tamarix, native east of the Caspian Sea, was first received for testing on the southern Plains in 1929. Since then it has been tested on 320 sites under varied conditions in 87 counties. Kashgar tamarix has done as well at an elevation of more than 6,000 feet in Colfax County, N. Mex., as at the Woodward station at an elevation of only 2,000 feet. The species tends toward upright branching and has attractive, compact bluish-green foliage. Plants allowed to grow naturally start blooming in early spring, while those that have been pruned back to the ground during the winter bloom in midsummer. Kashgar tamarix has been the choice among the many species of *Tamarix* tested on the southern Plains.

TAMARIX

(*Tamarix* spp.)

Several species of tamarix have become so common in parts of the southern Plains that local residents often refer to them with some disdain as "that wild shrub we can get on the river." As a matter of fact, none of the many species now growing in the area are native to any part of the United States, but are introductions from the

Mediterranean region to eastern Asia and India. The two principal species that have gone wild along stream courses are probably African (*Tamarix africana* Poir.) and fivestamen tamarix (*Tamarix pentandra* Pall.). The former was used rather extensively on the Plains in western Kansas and the Oklahoma Panhandle during the early settlement. Early settlers had considerable respect for tamarix, as they soon found that it was not particular as to site, could withstand drought, and made comparatively rapid growth. It was easy to propagate and often the only shrubs around a homesteader's shack or dugout were tamarix. The tamarix clumps remained as mute reminders of someone's dream as successive waves of settlers came and went.

Tamarix spp. as a group are very aggressive and have comparatively shallow, widespreading root systems. Their use in low wind-break hedges for gardens has often been suggested, but such use is recommended only when one keeps in mind the rooting characteristics. On open soils roots of tamarix will reach out as much as 75 feet from the base; therefore, it would hardly be feasible to attempt to plant garden or other crops within the zone of competition. Exceptions to this rule can, of course, be pointed out. One of the best uses of tamarix is as a hedge pruned back to the ground each winter. At Woodward a 10-year-old hedge handled in this fashion develops a height growth up to 7 feet and a large series of canes during the summer, making a very attractive, informal hedge with an abundance of summer bloom. When the hedge is sheared formally, particularly in box fashion, the bloom is, of course, sacrificed and the base tends to be open and without foliage. If a neat, attractive formal hedge with a compact form is desired, tamarix should be sheared in pyramidal or round-topped fashion; if it is kept to a height of only 16 to 24 inches it will be especially valuable. With normal care such a hedge needs shearing about every 3 or 4 weeks during the summer.

Considerable confusion exists in nomenclature of the various species of *Tamarix*, and only an expert can positively identify them. It is suggested that one make selections of the more desirable plants after observing their foliage and bloom characteristics and propagate these selections by cuttings. Tests over a period of years prove that under conditions at Woodward, an easy method of propagation is to make the cuttings from the previous season's wood just before growth begins in the spring and plant directly in the nursery row. The cuttings can be 8 to 12 inches from wood having a caliper of one-quarter to one-half inch. The cuttings should be planted so that about one-quarter inch of the top is above the surface of the soil.

Species of tamarix other than Kashgar tamarix that can be used on the southern Plains include fivestamen tamarix (*Tamarix pentandra* Pall.), Odessa tamarix (*T. odessana* Stev.), French tamarix (*T. gallica* L.), and fourstamen tamarix (*T. tetrandra* Pall.). Athel tamarix (*T. aphylla* (L.) Karst.), the only truly evergreen tamarix, has not proved hardy at Woodward. Athel tamarix is worth trying in southern Eddy and Lea Counties, N. Mex.

YELLOW TRUMPETBUSH

(*Tecoma stans* (L.) H. B. K.)

Yellow trumpetbush is native to Texas west of the Pecos River, southern New Mexico, and Arizona and southward. It has been

rather widely used in parts of southern Texas, where it has become a very valuable ornamental. It ranges from 4 feet to more than 10 in height and produces large trumpet-shaped yellow flowers during most of the summer. Tests on the southern Great Plains indicate that its range will include the southern boundary counties only. At Big Spring, Tex., yellow trumpetbush is an excellent specimen plant. Attempts to extend the range in the northerly direction have resulted in its behaving as an annual. At Woodward it freezes back to the roots every winter.

CHAMAEDRYS GERMANDER

(*Teucrium chamaedrrys* L.)

Chamaedrrys germander, the only woody germander tested, is a procumbent subshrub from Europe and western Asia. It grows to a height of only 8 to 12 inches, has very dark green, shiny leaves, and produces a series of spikes made up of small purple or rose-colored blooms. It is especially valuable when used as a border shrub or as a hedge. It makes a compact, uniform growth and does not require shearing.

ORIENTAL ARBORVITAE AND RELATED TYPES

(*Thuja* spp.)

Seedlings of oriental arborvitae (*Thuja orientalis* L.) can be kept sheared as specimens in foundation or border plantings, or they can be used as a natural or a sheared hedge. At Woodward this species has suffered considerable damage by late-spring storms like the one experienced in late March 1932. It is being used as a temporary species, however. In the southern part of the Plains it is more dependable and is an ideal species to use as a low windbreak to protect gardens. The species has a confined root system and does not sap an extended soil area. This is the easiest of all of the conifers to transplant bare-rooted. A number of selections of oriental arborvitae have been made, and seven of the group have been tested at Woodward. Only two, the compact form and the variety *Excelsa*, have been fairly successful. Both have been subject to burning of foliage by late-spring freezes.

ARIZONA ROSEWOOD

(*Vauquelinia californica* (Torr.) Sarg.)

Arizona rosewood is found growing naturally in only a limited part of the southwestern United States. Its range is from southwestern New Mexico to southern California. This broadleaved evergreen shrub is one of the few species from the Southwest that have been able to survive the extremes in temperature experienced during the winter at Woodward. During the 12 seasons it has been under observation, it has occasionally suffered freezing back and partial leaf burning. Arizona rosewood has developed as a many-branched shrub almost 7 feet in height and with a decidedly upright type of growth. The heavy, leathery leaves are glossy and of a narrow, lanceolate form with serrated edges. The small whitish blossoms, borne in flat-topped cymose panicles, are not particularly showy. Arizona rosewood has been reported as a host of one of the species of *Gymnosporangium* that attack junipers, and therefore further investigation will be necessary before any use can be suggested. Because evergreen shrub species

are in demand on the Plains, further study of the species is justified. Propagation is by seed.

LILAC CHASTE-TREE

(*Vitex agnus-castus* L.)

Lilac chaste-tree (fig. 19), also known as hemp tree, monk's pepper-tree, and Mexican lavender, is a native of southern Europe that has been useful on the farmsteads of the southern Great Plains. This species has been growing at the Woodward station since the early 1920's; and, because of its vigor and hardiness, it has been widely distributed for experimental observation. It is a large shrub up to 10 feet or more in height in the southern part of the area. In the northern part and at the higher elevations, it often winterkills and should be pruned back to the ground annually. In one season plants with well-established roots will reach a height of 6 to 8 feet. The clusters of pale-blue blooms are freely borne on the current-year growth from early summer until late fall. The narrow, dark-green leaflets, 5 to 7 in number, have a pungent aromatic odor. In group



Figure 19.—Lilac chaste-tree, a vigorous shrub that blooms freely during the heat of the summer and is valuable in border and screen plantings.

plantings where regular cultivation can be practiced, or where an additional runoff can be taken advantage of, lilac chaste-tree will survive without irrigation. This suggests its use in service yards to screen off corrals and feed lots. Lilac chaste-tree can be propagated either by cuttings under glass or by seed.

HARDY LILAC CHASTE-TREE

(*Vitex agnus-castus* var. *latifolia* (Mill.) Loud.)

Hardy lilac chaste-tree is a comparatively recent introduction into the nursery trade. This variety has the dark-green foliage and habit of growth of lilac chaste-tree, but it has pink blooms rather than the pale-blue ones of lilac chaste-tree. Hardy lilac chaste-tree has been widely tested on the southern Plains, and readings on its behavior show it to be almost identical with lilac chaste-tree in degree of hardiness to both drought and extremes in temperature. Propagation is by cuttings under glass.

CUTLEAF CHASTE-TREE

(*Vitex negundo* var. *incisa* (Bunge) Clarke)

Cutleaf chaste-tree, which has been introduced from China, differs in general appearance from lilac chaste-tree in having lighter green foliage, the leaflets of which are incised or toothed rather than being entire. The pale-blue bloom is not quite so showy as that of the lilac chaste-tree. The one advantage of the cutleaf species that has been noted a number of times is that it seemingly has been slightly more winter-hardy than lilac chaste-tree. Since nearly all chaste-trees are so aggressive in rate of growth that they need pruning back to the ground at regular intervals in order to keep them within bounds, this character has not been of much advantage except at the higher elevations. Propagation is by cuttings under glass.

INDEX TO COMMON NAMES

	Page		Page
Abelia, glossy	8	Buckthorn, lanceleaf	46
Adelia	28	Buffaloberry	50
Adina	8	Butterflybush, Farquhar	13
Amorpha, dwarfindigo	10	Butterflybush, fountain	12
Amorpha, indigobush	9	Butterflybush, Ile de France	12
Anisacanth, Wright	10	Butterflybush, Lindley	13
Apache-plume	26	Butterflybush, oxeye	12
Arborvitae, Excelsa	59	Buttonbush, common	16
Arborvitae, oriental	59	Catalpa, willow-leaved	19
Barberry, Japanese	11	Ceanothus, Fendler	16
Barometerbush	34	Ceanothus, inland	16
Beautyberry, American	14	Cenizo	34
Beautyberry, purple	14	Chaste-tree, cutleaf	61
Beautybush	32	Chaste-tree, hardy lilac	61
Bird-of-paradise	14	Chaste-tree, lilac	60
Bladder-senna, Cilician	20	Cliffrose	23
Bladder-senna, common	20	Coralberry, Chenault	53
Bluebeard, common	15	Coralberry, Indianecurrant	54
Bluebeard, Mongolian	15	Cotoneaster, multiflora	22
Bridalwreath	52	Cotoneaster, Peking	22
Broom, Scotch	23	Cotoneaster, spreading	22
Broom, spike	23	Crapemyrtle, common	33
Buckbrush	54	Currant, golden	47
Buckthorn, common	45	Dalea, black	24
Buckthorn, Dahurian	45	Dalea, feather	23
Buckthorn, glossy	45	Daphne, rose	24

	Page		Page
Desertwillow.....	19	Pea-tree, Russian.....	14
Dunebroom.....	41	Pea-tree, Siberian.....	14
Elder.....	50	Pea-tree, sophoraleaf.....	14
Elder, cutleaf American.....	48	Peppertree, monk's.....	60
Elder, Mexican.....	49	Perovskia, Russiansage.....	41
Elder, red-berried.....	49	Pine, Mugho Swissmountain.....	43
Elder, scarlet.....	49	Pine, umbrella.....	43
Euonymus, European.....	26	Pomegranate.....	44
Euonymus, winterberry.....	24	Ponil.....	26
False-indigo.....	9	Privet, Amur.....	35
Firethorn, Laland.....	44	Privet, Amur River North.....	35
Firethorn, scarlet.....	44	Privet, Chinese.....	36
Flore de mimbre.....	19	Privet, European.....	36
Fontanesia, Fortune.....	27	Privet, false.....	28
Forestiera, New Mexican.....	28	Privet, glossy.....	35
Forsythia, border.....	28	Privet, Japanese.....	35
Forsythia, Fortune weeping.....	28	Privet, Lodense.....	36
Forsythia, showy border.....	28	Privet, Quihou.....	35
Forsythia, Siebold weeping.....	28	Quince, flowering.....	18
Germander, chamaedrys.....	59	Quinine bush.....	23
Hardyorange.....	44	Redbud, American.....	16
Hemp tree.....	60	Redbud, eastern.....	16
Hollygrape, Oregon.....	39	Redbud, Texas.....	18
Honeysuckle, Amur.....	38	Rose of sharon.....	28
Honeysuckle, blueleaf.....	38	Rosewood, Arizona.....	59
Honeysuckle, fragrant.....	37	Sage, autumn.....	48
Honeysuckle, Morrow.....	39	Sage, shrubby blue.....	48
Honeysuckle, Tatarian.....	39	Sagebrush, common sand.....	11
Honeysuckle, winter.....	37	Serviceberry, shadblow.....	9
Indigo, Kirilow.....	29	Serviceberry, Success.....	9
Jasmine, Bees.....	29	Shrub-althea.....	28
Jasmine, winter.....	29	Silverleaf, Texas.....	34
Jersey-tea.....	16	Silversage.....	41
Juniper, Andorra.....	30	Skunkbush.....	47
Juniper, fountain.....	32	Smoketree, American.....	21
Juniper, Pfitzer.....	30	Smoketree, common.....	21
Juniper, tamarix.....	31	Snowberry, common.....	53
Juniper, Vonehron.....	31	Snowberry, spreading.....	53
Juniper, Waukegan.....	30	Snowberry, western.....	53
Lavender, Mexican.....	60	Snowberry, white.....	53
Lavender-cotton.....	50	"Spirea," blue.....	15
Leadplant.....	9	Spirea, bridalwreath.....	51
Lespedeza, shrub.....	34	Spirea, Douglas.....	51
Lilac.....	57	Spirea, garland.....	50
Lilac, Amur.....	54	Spirea, Korean.....	52
Lilac, Chinese.....	55	Spirea, Reeves.....	51
Lilac, common.....	56	Spirea, Thunberg.....	51
Lilac, Japanese tree.....	54	Spirea, Vanhoutte.....	52
Lilac, Persian.....	56	Sumac, flameleaf.....	46
Lilac, Rothamagensis.....	55	Sumac, Illinois fragrant.....	46
Mahonia, creeping.....	40	Sumac, lemonade.....	47
Mockorange, Gordon.....	42	Sumac, littleleaf.....	46
Mockorange, sweet.....	41	Sumac, shining.....	46
Mockorange, virginal.....	42	Sumac, smooth.....	46
Mountain-mahogany, true.....	18	Tamarix, African.....	58
Nandina.....	40	Tamarix, Athel.....	58
Olive, New Mexican wild.....	28	Tamarix, fivestamen.....	58
Orange, trifoliolate.....	44	Tamarix, fourstamen.....	58
Oregon grape.....	39	Tamarix, French.....	58
Paloblanco.....	28	Tamarix, Kashgar.....	57
Peabush.....	24	Tamarix, Odessa.....	58
Pearlbush, common.....	26	Tanglebush.....	28
Pea-tree, dwarf.....	14	Trumpetbush, yellow.....	58
Pea-tree, littleleaf.....	14	Willow, flowering.....	19
Pea-tree, pygmy.....	14	Wormwood, oldman.....	11

U. S. GOVERNMENT PRINTING OFFICE: 1951

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 20 cents